

FURUNO

INSTALLATION MANUAL

**DOPPLER SONAR
CURRENT INDICATOR**

MODEL **CI-60/60G**



FURUNO ELECTRIC CO., LTD.
NISHINOMIYA, JAPAN

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•Your Local Agent/Dealer

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CI-60/60G



* 00080209700 *



SAFETY INSTRUCTIONS

"DANGER", "WARNING" and "CAUTION" notices appear throughout this manual. It is the responsibility of the installer of the equipment to read, understand and follow these notices. If you have any questions regarding these safety instructions, please contact a FURUNO agent or dealer.



DANGER

This notice indicates a potentially hazardous situation which, if not avoided, will result in death or serious injury.



WARNING

This notice indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.



CAUTION

This notice indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury, or property damage.

WARNING



Only qualified personnel should work inside the equipment.

This equipment uses high voltage electricity which can shock, burn, or cause death.

Turn off the power at the ship's mains switchboard before beginning the installation. Post a warning sign near the switchboard to ensure that the power will not be applied while the equipment is being installed.

Serious injury or death can result if the power is not turned off, or is applied while the equipment is being installed.

CAUTION



Ground the equipment.

Ungrounded equipment can give off or receive electromagnetic interference or cause electrical shock.

Confirm that the power supply voltage is compatible with the voltage rating of the equipment.

Connection to the wrong power supply can cause fire or equipment damage. The voltage rating appears on the label at the rear of the equipment.

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SPECIFICATIONS

1. MEASURING RANGE

1) TIDE SPEED/DIRECTION

Speed: 0.0 to 9.9 kts
 Direction: All directions in one degree steps (True bearing if external heading input is available.)
 No. of measuring layers: Three layers
 Measurable depth of tide: Ground tracking mode

| Water Depth (D) | Measurable Depth of Tide |
|--------------------------------------|---|
| $D < 13 \text{ m}$ | Not measurable |
| $13 \text{ m} \leq D < 40 \text{ m}$ | 2 m to $(D - 10) \text{ m}$ |
| $40 \text{ m} \leq D$ | 2 m to 100 m or 2 m to $(0.75 \times D) \text{ m}$ |

} Whichever is shallower.

Water tracking mode/Nav-aided mode (narrow pulse)*

| Water Depth (D) | Measurable Depth of Tide |
|--------------------------------------|---|
| $D < 40 \text{ m}$ | Not measurable |
| $40 \text{ m} \leq D < 90 \text{ m}$ | 2 m to $(D - 10) \text{ m}$ |
| $90 \text{ m} \leq D$ | 2 m to 100 m or 2 m to $(0.75 \times D) \text{ m}$ |

} Whichever is shallower.

Water tracking mode/Nav-aided mode (wide pulse)

| Water Depth (D) | Measurable Depth of Tide |
|---------------------------------------|---|
| $D < 70 \text{ m}$ | Not measurable |
| $70 \text{ m} \leq D < 140 \text{ m}$ | 2 m to $(D - 10) \text{ m}$ |
| $140 \text{ m} \leq D$ | 2 m to 100 m or 2 m to $(0.75 \times D) \text{ m}$ |

} Whichever is shallower.

* Measurable depth is subject to change with water conditions, transducer site, amount of interference, etc. 100m is the maximum measurable depth of tide under typical conditions.

* Transmission pulse width selectable by an internal DIP switch.

2) SHIP'S SPEED/COURSE

Speed: [Fore- aft] -10.0 kt to +30.0 kt
 [Port- stbd] -9.9 kt to +9.9 kt
 Direction: All directions in one degree steps
 (Relative and true bearing)
 Measurable depth: Ground tracking mode
 3 m to 200 m typ. (Max. depth is subject to change with water conditions, transducer site, etc.)
Water tracking mode
 40 m or deeper (with narrow pulse)
 70 m or deeper (with wide pulse)

2. DISPLAY

1) DISPLAY DEVICE

12" high-resolution color CRT

2) DISPLAY ITEM

Text display (in table form)

| | | |
|----------------------|-------------------------------|------------------|
| Tide speed: | □ . □ (kt) | } (for 3 layers) |
| Tide direction: | □□□ (°) or 32-point notation | |
| Depth of tide layer: | □□□ (m) | |
| Ship's speed: | □□ . □ (kt) | |
| Ship's course: | □□□ (°) or 32-point notation | |
| Ship's heading: | □□□ . □ (°) (external data) | |
| Course calibration: | □□□ . □ (°) (CI-60G only) | |
| Present time: | □□ (h) □□ (m) □□ (s) | |
| Total mileage: | □□□□□ . □□ (nm) | |

Optional text display (display on/off switchable)

| | | |
|------------------------------|--|---------------|
| Tide differential speed: | □ . □ (kt) | |
| Tide differential direction: | □□□ (°) or 32-point notation | |
| Lateral speed: | □□ . □ (kt) | |
| Drift angle (leeway angle): | □□ (°) | |
| Trip distance: | □□□□ . □□ (nm) | } alternative |
| Trip time: | □□ (h) □□ (m) □□ (s) | |
| Water temperature: | □□ . □ (°C) (Needs external temperature data.) | |

Graphic display

| | |
|---------------------------|--|
| Tide vector: | Tide speed and direction for each layer are presented by length and pointing direction of a radial bar. Color of vector bar represents layer. |
| Tide differential vector: | Speed and direction of tide differential are presented by length and pointing direction of a radial bar. Colors of vector bar represent the layers involved. |
| Echo level: | Variation of echo strength with depth is presented either in color sounder mode or in A-scope mode. (simultaneously for three sounding beams) |
| Course track plot: | Ship's course track made of last 200 sampling points is presented in ship-centered format. (Display on/off switchable) |
| Tide history: | Tide vectors recorded at last 24 sampling points are presented on one screen. (24 hours max.) |
| Tide effect: | Simulated movements of tide layers below the ship's course track. (Display on/off switchable.) |
| Water temperature: | Water temperature graph over last 17.5 minutes are displayed. (External temperature data input required.) |

3. ACCURACY

Tide speed: $\pm 2\%$ or ± 0.2 Kt, whichever is greater
Ship speed: $\pm 1\%$ or ± 0.1 Kt, whichever is greater

4. SOUNDING FREQUENCY

244 kHz approx.

5. EXTERNAL INPUT/OUTPUT

INPUT

Heading data: * Serial Signal 1 ch.
External keying pulse: * Current loop signal 2 ch.
Miscellaneous: * Serial Signal 1 ch.
Heading; (\$**HDT/HDM/HCD/HCC)
Depth; (\$**DBS/DBT/DBK)
W-temp; (\$**MTW)
Date/time: (\$**ZDA/ZLZ/ZZU)

OUTPUT

Log signal: * 200 pulses/nm (contact signal), fore only 2 ch.
(Contact capacity; 0.2 A/30 V max.)
* 400 pulses/nm (TTL level), fore only 1 ch.
True bearing data: * Serial Signal 1 ch.
External alarm: * Contact signal 1 ch.
(Contact capacity; 0.2 A/30 V)
* Speaker output 1 ch.
(800 mW into 4 to 8 ohms)
Keying pulse: * Current/TTL (pos/neg/dif) 1 ch.
Miscellaneous: * Serial Signal 1 ch.
Speed/course; (\$VDVTG/VHW/VBW)
Set & drift; (\$VDVDR)
Tide spd/dir; (\$VDVCD)
Complex: * Furuno CI-7000 format 1 ch.
(Date/time, ship's speed/course, tide speeds/directions,
water temperature, etc.)
NMEA data: *VHW/VBW/VTG/VCD/VDR/CUR

6. MISCELLANEOUS FUNCTIONS

Self-check function,
Simple demonstration function

7. POWER SUPPLY

Main's input: 100/110/115/120/200/220/230/240 VAC, 50/60Hz, 1 ϕ
Power consumption: 300 VA average (800 VA peak)

8. ENVIRONMENTAL CONDITIONS

| | |
|--------------|-------------------------------|
| Temperature: | 0 to 45 °C |
| Humidity: | 80% RH (without condensation) |

9. COATING COLOR

| | |
|-------------------|--|
| Display unit: | Front panel; Munsell N1.5, Newtone No.5 Cover plate; Munsell 2.5GY5/1.5 (standard) or 2.5G7/2 |
| Transceiver Unit: | Munsell 2.5GY5/1.5 (standard) or 2.5GY7/2 |
| Junction Box: | Munsell 2.5G7/2 |

10. NAV-AIDED TIDE MEASUREMENT

Even where ground tracking is unattainable, absolute tide movements (tide on ground) can be calculated by applying accurate position and heading data to CI-60G. This function may be extremely useful in deep sea purse seining or in oceanographic survey.

To obtain accurate tide data against dynamic ship's movement, however, the speed and heading data must be applied from GPS navigator and gyro compass respectively. It is also desirable to use Furuno data format for interfacing. For further details, contact your Furuno agent.

Note: 1. Depths are measured below transducer surface.

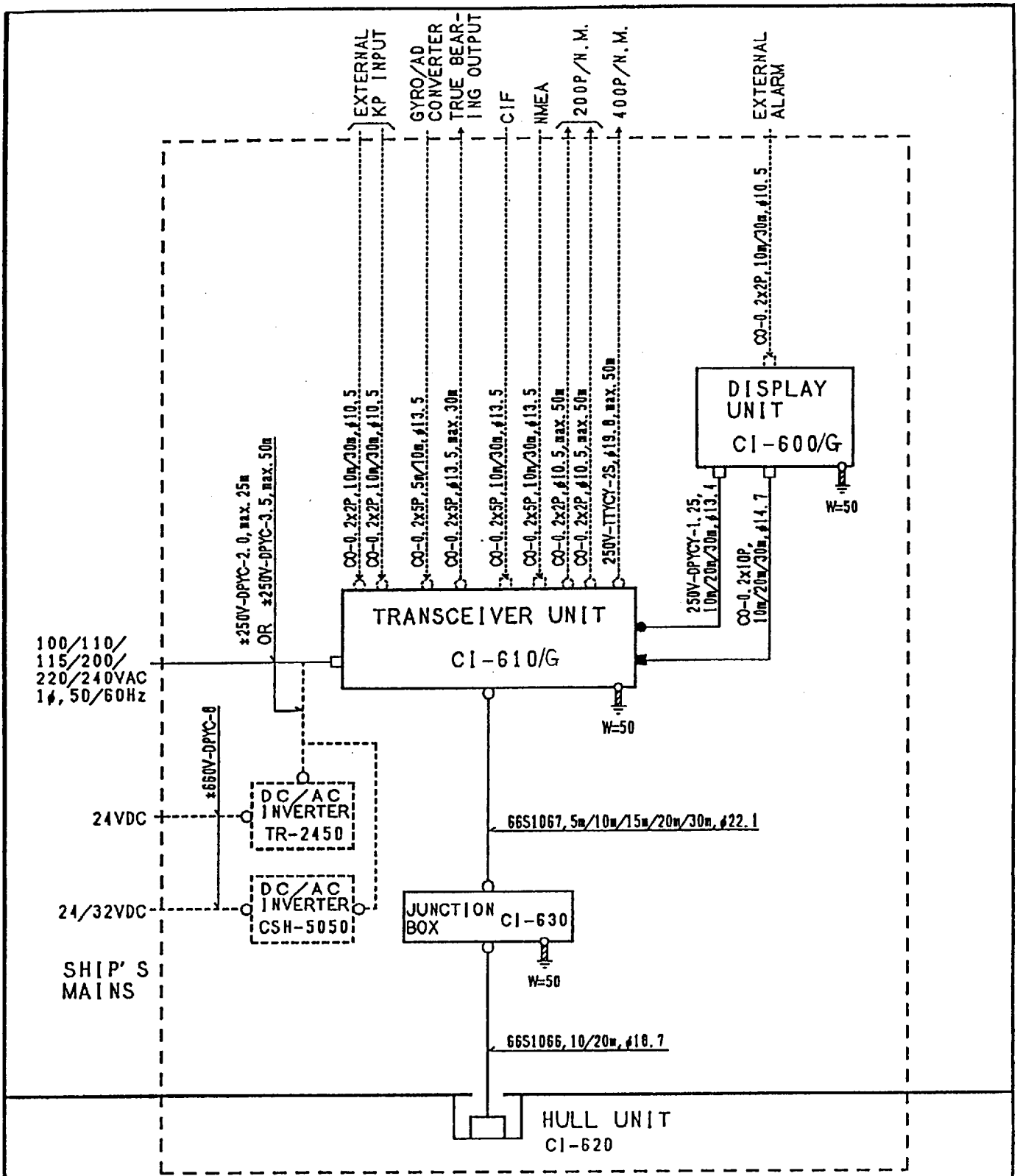
2. The CI-60G uses an acoustic wave for speed measurements. Aeration due to rapid acceleration/deceleration, heavy engine/propeller vibration or interference from other sounding equipments can degrade performance of this equipment.
3. Tide speed measurements are made by detecting echoes from underwater microscopic objects like plankton. If density of microscopic objects is too high or too low, depending on season or operating areas, CI-60G may not provide normal measuring performance.

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| 構 成 表 COMPLETE SET | | カラー潮流観測装置 CI-60G DOPPLER SONAR CURRENT INDICATOR | | | |
|---------------------------------|--|--|-----------------------|---|-----------------------------|
| 番号 No. | 名 称 N A M E | 型 名 T Y P E | 重 量 WEIGHT (kg) | 数 量 Q'TY | 備 考 R E M A R K S |
| 1 | 指 示 器 DISPLAY UNIT | CI-600G | 19 | 1 | |
| 2 | 送 受 信 演 算 部 TRANSCEIVER UNIT | CI-610G | 32 | 1 | |
| 3 | 接 続 箱 JUNCTION BOX | CI-630 | 2 | 1 | |
| 4 | 送 受 波 器 TRANSDUCER | CI-620-1 | 21 | 1 | 10m ケーブル付 WITH 10m CABLE |
| | | CI-620-2 | 26 | | 20m ケーブル付 WITH 20m CABLE |
| 5 | 送受波器ケース及び電線貫通 金物 CASING & THRU-HULL PIPE | CI-620-K-S CI-620-T-S | 69 | 1 | 鉄船用 FOR STEEL HULL |
| | | CI-620-K-F CI-620-T-F | 25 | | FRP 船用 FOR FRP HULL |
| 6 | 工 事 材 料 INSTALLATION MATERIALS | | | 1 式 SET | |
| 7 | 付 属 品 ACCESSORIES | | | 1 式 SET | |
| 8 | 予 備 品 SPARE PARTS | | | 1 式 SET | |
| 9 | D C - A C イ ン バ ー タ ー DC-AC INVERTER | TR-2450 | 35 | * | |
| 10 | D C - A C イ ン バ ー タ ー DC-AC INVERTER | CSH-5050 | 21 | * | |
| * オプション支給品。 OPTIONAL SUPPLY. | | | | <input checked="" type="checkbox"/> 番 DWG. No. C7228-H01-A <input checked="" type="checkbox"/> 検 CHECKED | |

Optional Equipment

| No. | Name | Type | Mass (kg) | Remarks |
|-----|--------------------|----------|--------------------------|--|
| 1 | DC-AC Inverter | TR-2450 | 35 | |
| 2 | DC-AC Inverter | CSH-5050 | 21 | |
| 3 | Distribution Unit | DS-370 | 19 | |
| 4 | Digital Indicator | DS-350 | 7.0 | |
| | | DS-351 | 4.0 | Flush mount |
| 5 | Remote Box | DS-359 | 0.7 | For DS-351 |
| 6 | Analog Indicator | DS-381 | 6.4 | -10 to 40 kt, ϕ 200, Flush mount |
| | | DS-382 | 6.0 | -10 to 40 kt, ϕ 200, Bulkhead mount |
| | | MF-22A-1 | 6.4 | -10 to 30 kt, ϕ 200, Flush mount |
| | | MF-22A-2 | 6.0 | -10 to 30 kt, ϕ 200, Bulkhead mount |
| | | MF-22A-3 | 1.3 | -10 to 30 kt, ϕ 200, Flush mount |
| | | MF-22A-4 | 4.4 | -10 to 30 kt, ϕ 200, Flush mount (less brim) |
| | | MF-22A-6 | 6.0 | -10 to 30 kt, ϕ 200, Flush mount |
| | | MF-22A-7 | 6.0 | -10 to 30 kt, ϕ 200, Bulkhead mount (counterclockwise dial) |
| | | MF-22A-8 | 6.0 | -10 to 30 kt, ϕ 200, Bulkhead mount (counterclockwise dial) |
| | MF-22A-9 | 2.3 | -10 to 30 kt, ϕ 150 | |
| 7 | Range Switch Box | DS-389 | 0.7 | Flush mount |
| 8 | Dimmer | MF-22L-1 | 1.2 | Flush mount |
| | | MF-22L-2 | 1.3 | Bulkhead mount |
| 9 | Distance Indicator | DS-730 | 1.7 | Flush mount / Tabletop mount |



CI-60 DOPPLER SONAR CURRENT INDICATOR

NOTE

- * : SHIPYARD SUPPLY
- ☐ : CONNECTOR (☐ : FACTORY-FITTED)
- ⊙ : CRIMP-ON LUG (⊙ : FACTORY-FITTED)
- ⊥ : GROUNDING COPPER STRAP
- ⊥ : GROUNDING WIRE 1V-8sq.
- ↑ : CABLE SUPPLY SIDE
- : OPTIONAL SUPPLY


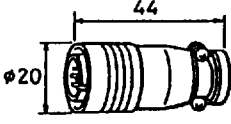
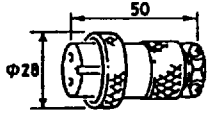
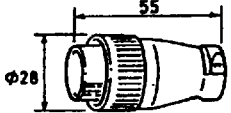
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 CO-0, 2x5P: CO-SPEVV-SB-CO, 2x5P, #13.5
 CO-0, 2x10P: CO-SPEVV-SB-CO, 2x10P, #14.7




| | | | |
|----------|--------------------------|----------|------------------------------------|
| APPROVED | JULY-18-'90 T. YAKAJO | TITLE | CI-60/G |
| CHECKED | JULY-18-'90 M. IKEDA | | DOPPLER SONAR CURRENT INDICATOR |
| DRAWN | JUL-17-'90 TAKAHASHI | DWG. NO. | E7228D01B000 |

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|----------|-------------|---------------|
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| TYPE | CP66-00701 | |


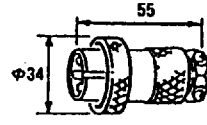
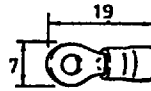
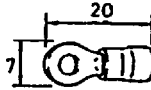
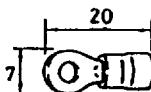
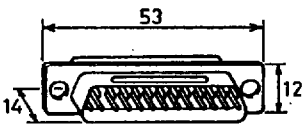
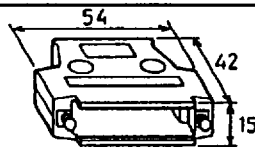
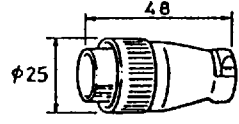
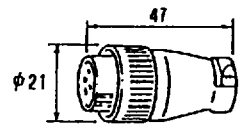
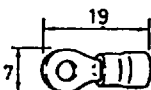


| | |
|--|--|
| 工事材料表 INSTALLATION MATERIALS | CI-60 カラー潮流観測装置 CI-60G DOPPLER SONAR CURRENT INDICATOR (指示器用) FOR DISPLAY UNIT CI-600/600G |
|--|--|

| 番号 No. | 名称 NAME | 略図 OUTLINE | 型名 / 規格 DESCRIPTIONS | 数量 Q'TY | 用途 / 備考 REMARKS |
|-----------|----------------------|--|--|------------|-------------------------|
| 1 | アース板 COPPER STRAP |  | WEA-1004 CODE No. 500-310-040 | 1 | |
| 2 | コネクタ CONNECTOR |  | PRC03-12A10-5M10.5 CODE No. 000-110-679 | 1 | P33 (外部警報) 用 FOR P33 |
| 3 | コネクタ CONNECTOR |  | NCS-252-P CODE No. 000-506-501 | 1 | P31 (電源) 用 FOR P31 |
| 4 | コネクタ CONNECTOR |  | SRCN6A21-16P CODE No. 000-508-664 | 1 | P32 (信号) 用 FOR P32 |
| | | | CODE No. | | |
| | | | CODE No. | | |
| | | | CODE No. | | |
| | | | CODE No. | | |
| | | | CODE No. | | |

| | | |
|----------------|---|---|
| 図番 DWG. No. | C7228-M01-B | 1/1 |
| 検図 CHECKED |  |  |
| |  | |

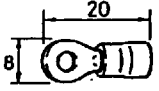
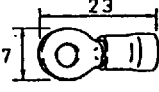
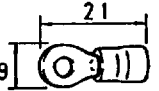


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|----------|-------------|---------------|
| CODE No. | 006-924-580 | 66AL-X-9402-1 |
| TYPE | CP66-00702 | |

| 工事材料表 INSTALLATION MATERIALS | | CI-60 CI-60G (送受信演算部用) | | カラー潮流観測装置 DOPPLER SONAR CURRENT INDICATOR FOR TRANSCEIVER UNIT CI-610/610G | |
|---------------------------------|-------------------------|---|-------------------------|---|---|
| 番号 No. | 名称 NAME | 略図 OUTLINE | 型名 / 規格 DESCRIPTIONS | 数量 Q'TY | 用途 / 備考 REMARKS |
| 1 | アース板 COPPER STRAP |  | WEA-1004 | 1 | |
| | | | CODE No. | | |
| 2 | コネクタ CONNECTOR |  | NCS-303-P | 1 | 船内電源用 FOR SHIP'S MAINS |
| | | | CODE No. | | |
| 3 | 圧着端子 CRIMP-ON LUG |  | FV0.5-3.7 黄 YEL | 10 | TB1 用 FOR TB1 |
| | | | CODE No. | | |
| 4 | 圧着端子 CRIMP-ON LUG |  | FV2-P4 青 BLU | 5 | 4対ケーブル シールド線用 FOR SHIELD OF 4 PAIR CABLE |
| | | | CODE No. | | |
| 5 | 圧着端子 CRIMP-ON LUG |  | FV2-P3.5 青 BUL | 6 | TB1, シールド線用 FOR SHIELD TO TB1 |
| | | | CODE No. | | |
| 6 | コネクタ CONNECTOR |  | 17JE-23250-02 (D1) | 2 | P103 (NMEA) 用 FOR P103 (NMEA) |
| | | | CODE No. | | |
| 7 | コネクタフード HOUSING CASE |  | 17JE-25H-1A | 2 | P103 (NMEA) 用 FOR P103 (NMEA) |
| | | | CODE No. | | |
| 8 | コネクタ CONNECTOR |  | SRCN6A16-10P | 1 | P102 (CIF) 用 FOR P102 (CIF) |
| | | | CODE No. | | |
| 9 | コネクタ CONNECTOR |  | SRCN6A13-5S | 1 | P105用 FOR P105 |
| | | | CODE No. | | |
| 10 | 圧着端子 CRIMP-ON LUG |  | FV1.25-M3 赤 RED | 16 | TB1 用 FOR TB1 |
| | | | CODE No. | | |
| | | | 図番 DWG. No. | C7228-M02-C | 1/2 |
| | | | 検図 CHECKED |  |  |


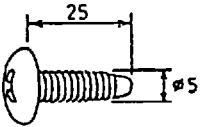
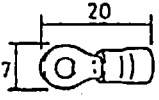
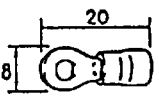
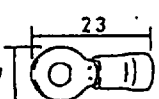
FURUNO

| | | |
|----------|-------------|---------------|
| CODE No. | 006-924-580 | 66AL-X-9403-2 |
| TYPE | CP66-00702 | |

| 工事材料表 INSTALLATION MATERIALS | | CI-60 CI-60G (送受信演算部用) | | カラー潮流観測装置 DOPPLER SONAR CURRENT INDICATOR FOR TRANSCIEVER UNIT CI-610/610G | | | |
|---------------------------------|----------------------|--|--------------------------|--|------------|---|---|
| 番号 No. | 名称 NAME | 略 図 OUTLINE | 型名 / 規格 DESCRIPTIONS | | 数量 Q'TY | 用途 / 備考 REMARKS | |
| 1 1 | 圧着端子 CRIMP-ON LUG |  | FV1.25-4 | | 9 | 4対ケーブル芯線用 FOR CORES OF 4 PAIR CABLE | |
| | | | CODE No. | 000-538-114 | | | |
| 1 2 | 圧着端子 CRIMP-ON LUG |  | FV5.5-S4 | | 2 | 4対ケーブル一括 シールド線用 FOR OUTER SHIELD OF 4 PAIR CABLE | |
| | | | CODE No. | 000-538-121 | | | |
| 1 3 | 圧着端子 CRIMP-ON LUG |  | FV2-5 青 BLU | | 14 | あじろ鍍装アース用 FOR GND OF ARMOR | |
| | | | CODE No. | 000-107-331 | | | |
| 1 4 | ビニール線 VINYL WIRE |  | VSF2.0SQ 黒 BLK * 5M * | | 1 | あじろ鍍装アース用 FOR GND OF ARMOR | |
| | | | CODE No. | 000-121-401 | | | |
| | | | CODE No. | | | | |
| | | | CODE No. | | | | |
| | | | CODE No. | | | | |
| | | | CODE No. | | | | |
| | | | CODE No. | | | | |
| | | | | | | 図番 DWG. No. C7228-M03-E | 2/2 |
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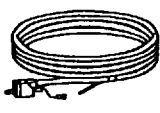
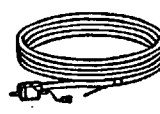
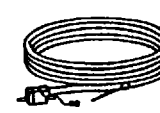
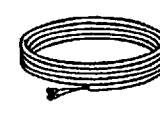
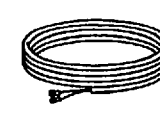
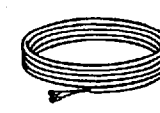
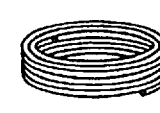
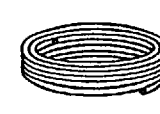
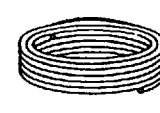
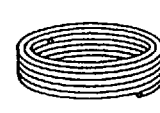
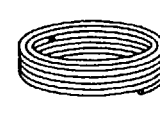



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|----------|-------------|-------------|
| CODE No. | 006-927-330 | 66AL-X-9405 |
| TYPE | CP66-00703 | |

| 工事材料表 INSTALLATION MATERIALS | | CI-60 カラー潮流観測装置 CI-60G DOPPLER SONAR CURRENT INDICATOR (接続箱用) FOR JUNCTION BOX CI-630 | | | |
|---------------------------------|------------------------------|---|-------------------------|------------|---|
| 番号 No. | 名称 NAME | 略図 OUTLINE | 型名 / 規格 DESCRIPTIONS | 数量 Q'TY | 用途 / 備考 REMARKS |
| 1 | アース板 COPPER STRAP |  | WEA-1004 | 1 | |
| | | | CODE No. | | |
| 2 | ⊕トラスタッピングネジ TAPPING SCREW |  | 5 × 25 SUS304 1種 | 4 | |
| | | | CODE No. | | |
| 3 | 圧着端子 CRIMP-ON LUG |  | FV2-P4 青 BLU | 10 | シールド線用 FOR SHIELD WIRES |
| | | | CODE No. | | |
| 4 | 圧着端子 CRIMP-ON LUG |  | FV1.25-4 | 18 | 芯線用 FOR CORES |
| | | | CODE No. | | |
| 5 | 圧着端子 CRIMP-ON LUG |  | FV5.5-5 | 3 | 一括シールド、鍍装 アース用 FOR OUTER SHIELD & GND OF ARMOR |
| | | | CODE No. | | |
| | | | CODE No. | | |
| | | | CODE No. | | |
| | | | CODE No. | | |
| | | | CODE No. | | |
| | | | CODE No. | | |

| | | | |
|----------------|---|---|---|
| 図番 DWG. No. | 1/1 | | |
| 検図 CHECKED |  |  |  |

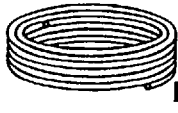
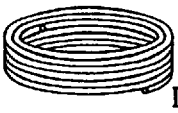
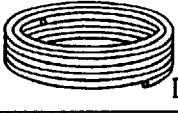
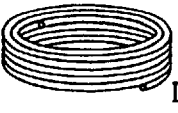
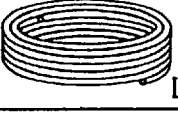
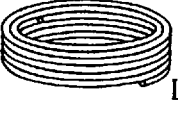
FURUNO

| | | |
|----------|--|---------------|
| CODE No. | | 66AL-X-9404-1 |
| TYPE | | |

| 工事材料表 INSTALLATION MATERIALS | | CI-60 CI-60G (ケーブル) | 潮流観測装置 DOPPLER SONAR CURRENT INDICATOR CABLE | | | |
|---|--------------------------------|---|--|--|---|---|
| 番号 No. | 名称 NAME | 略図 OUTLINE | 型名 / 規格 DESCRIPTIONS | | 数量 Q'TY | 用途 / 備考 REMARKS |
| 1 | 信号ケーブル組品 SIGNAL CABLE ASSY. |  L=10m | S66-4-10 (20P) CODE No. 006-924-510 | | | CI-600↔CI-610 CI-600G ↔CI-610G 選 択 TO BE SELECTED |
| | 信号ケーブル組品 SIGNAL CABLE ASSY. |  L=20m | S66-4-20 (20P) CODE No. 006-924-520 | | | |
| | 信号ケーブル組品 SIGNAL CABLE ASSY. |  L=30m | S66-4-30 (20P) CODE No. 006-924-530 | | | |
| 2 | 電源ケーブル組品 POWER CABLE ASSY. |  L=10m | P66-1-10 CODE No. 006-924-540 | | | CI-600↔CI-610 CI-600G ↔CI-610G * 選 択 TO BE SELECTED |
| | 電源ケーブル組品 POWER CABLE ASSY. |  L=20m | P66-1-20 CODE No. 006-924-550 | | | |
| | 電源ケーブル組品 POWER CABLE ASSY. |  L=30m | P66-1-30 CODE No. 006-924-560 | | | |
| 3 | 4 対 ケーブル 4 PAIR CABLE |  L=5m | 66S1067 * 5M * CODE No. 000-120-210 | | | CI-630↔CI-610 CI-630↔CI-610G * 選 択 TO BE SELECTED |
| | 4 対 ケーブル 4 PAIR CABLE |  L=10m | 66S1067 * 10M * CODE No. 000-120-226 | | | |
| | 4 対 ケーブル 4 PAIR CABLE |  L=15m | 66S1067 * 15M * CODE No. 000-120-227 | | | |
| | 4 対 ケーブル 4 PAIR CABLE |  L=20m | 66S1067 * 20M * CODE No. 000-120-228 | | | |
| | 4 対 ケーブル 4 PAIR CABLE |  L=30m | 66S1067 * 30M * CODE No. 000-120-229 | | | |
| * : 1と2は同じ長さのものを選択すること。 SELECT SAME LENGTH CABLES. | | | 図番 DWG. No. C7228-M04-D | | | |
| | | | 検図 CHECKED | |    | |


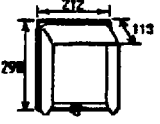
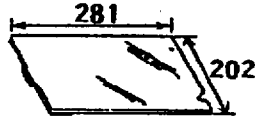
FURUNO

| | |
|----------|--|
| CODE No. | |
| TYPE | |

| 工事材料表 INSTALLATION MATERIALS | | カラー潮流観測装置 CI-60 DOPPLER SONAR CURRENT INDICATOR オプションケーブル OPTION CABLE | | | |
|---------------------------------|--------------------------|---|--------------------------------------|-------------|---------------------------------------|
| 番号 No. | 名称 NAME | 略図 OUTLINE | 型名/規格 DESCRIPTIONS | 数量 Q'TY | 用途/備考 REMARKS |
| 1 | 5 対 ケーブル 5 PAIR CABLE |  L=10m | CO-SPEVV-SB-C 0.2 x 5P * 10M * | | CIF/NMEA用 FOR CIF/NMEA |
| | | | CODE No. | 000-560-452 | |
| | 5 対 ケーブル 5 PAIR CABLE |  L=30m | CO-SPEVV-SB-C 0.2 x 5P * 30M * | | |
| | | | CODE No. | 000-116-747 | |
| 2 | 2 対 ケーブル 2 PAIR CABLE |  L=10m | CO-SPEVV-SB-C 0.2 x 2P * 10M * | | 干渉除去用 FOR INTERFERENCE REJECTOR |
| | | | CODE No. | 000-120-792 | |
| | 2 対 ケーブル 2 PAIR CABLE |  L=30m | CO-SPEVV-SB-C 0.2 x 2P * 30M * | | |
| | | | CODE No. | 000-120-214 | |
| 3 | 5 対 ケーブル 5 PAIR CABLE |  L=5m | CO-SPEVV-SB-C 0.2 x 5P * 5M * | | A/D コンバータ用 FOR A/D CONVERTER |
| | | | CODE No. | 000-560-451 | |
| | 5 対 ケーブル 5 PAIR CABLE |  L=10m | CO-SPEVV-SB-C 0.2 x 5P * 10M * | | |
| | | | CODE No. | 000-560-452 | |
| | | | CODE No. | | |
| | | | CODE No. | | |
| | | | CODE No. | | |
| | | | CODE No. | | |
| | | | 図番 DWG. No. | C7228-M06-A | |
| | | | 検 CHECKED | | |

FURUNO

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|----------|-------------|-----------------------|
| CODE NO. | 000-069-757 | 66AL-X-9501 -3 1/1 |
| TYPE | FP66-00400 | |

| 付属品表 ACCESSORIES | | CI-60/60G CI-35/35H | ドプラ観測装置 DOPPLER SONAR CURRENT INDICATOR | | | |
|---------------------|---------------------------------|---|--|-------------|------------|------------------|
| 番号 NO. | 名称 NAME | 略図 OUTLINE | 型名/規格 DESCRIPTIONS | | 数量 Q'TY | 用途/備考 REMARKS |
| 1 | Eニ-カバー-(12インチ) PLASTIC COVER |  | 66-017-2111 | | 1 | |
| | | | CODE NO. | 000-802-058 | | |
| 2 | フード組品 HOOD ASSY. |  | FP03-02910 | | 1 | |
| | | | CODE NO. | 008-223-520 | | |
| 3 | 12インチフィルター 12"FILTER |  | 02-083-1601-2 | | 1 | |
| | | | CODE NO. | 100-103-562 | | |

DWG NO.

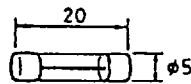
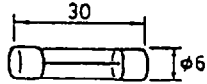
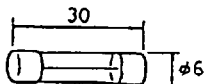
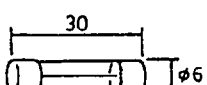
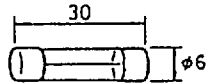
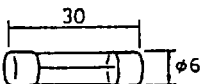
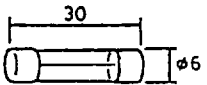
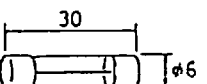
C7228-F01- D

FURUNO ELECTRIC CO., LTD

(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

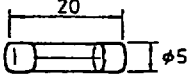
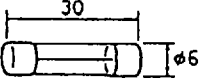
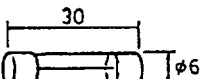
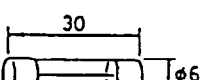
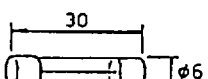
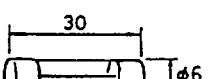
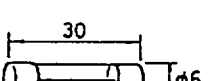
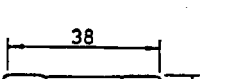
FURUNO

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| CODE No. | 000-069-755 | BOX No. _____ P _____ |
| TYPE | SP66-00400 | |

| SHIP No. | SPARE PARTS LIST FOR | | U S E | | | | SETS PER VESSEL |
|------------|--|---|--|----------|-----------------------|-------|---|
| | CI-60 カラー潮流観測装置 CI-60G DOPPLER SONAR CURRENT INDICATOR | | FOR 100VAC用 | | | | |
| ITEM No. | NAME OF PART | O U T L I N E | DWG. No. OR TYPE No. | QUANTITY | | | REMARKS/CODE No. |
| | | | | WORKING | | SPARE | |
| | | | | PER SET | PER VES. | | |
| 1 | ミゼットヒューズ FUSE |  | FGMB 0.5A AC125V | 1 | | 3 | 指示器用 FOR DISPLAY UNIT 000-114-994 |
| 2 | 管入りヒューズ FUSE |  | FGBO-A 5A AC125V | 2 | | 6 | 指示器用 FOR DISPLAY UNIT 000-549-064 |
| 3 | 管入りヒューズ FUSE |  | FGBO 7A AC125V OR JSO 7A 125V | 3 | | 5 | 送受信演算部用 FOR TRANSCEIVER UNIT 000-549-013 |
| 4 | 管入りヒューズ FUSE |  | FGBO-A 1A AC125V OR JSO 1A 125V | 1 | | 3 | 送受信演算部用 FOR TRANSCEIVER UNIT 000-549-061 |
| 5 | 管入りヒューズ FUSE |  | FGBO-A 3A AC125V OR JSO 3A 125V | 1 | | 3 | 送受信演算部用 FOR TRANSCEIVER UNIT 000-549-063 |
| 6 | 管入りヒューズ FUSE |  | FGBO-A 5A AC125V OR JSO 5A 125V | 1 | | 3 | 送受信演算部用 FOR TRANSCEIVER UNIT 000-549-064 |
| 7 | 管入りヒューズ FUSE |  | FGBO 10A AC125V | 1 | | 3 | 送受信演算部用 FOR TRANSCEIVER UNIT 000-549-065 |
| 8 | 管入りヒューズ FUSE |  | FGBO 15A AC125V | 2 | | 4 | 送受信演算部用 FOR TRANSCEIVER UNIT 000-549-014 |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| MFR'S NAME | FURUNO ELECTRIC CO., LTD. | | | DWG. No. | C 7 2 2 8 - P 0 1 - C | | |

FURUNO

| | | |
|----------|-------------|---|
| CODE No. | 000-069-756 | BOX No. <u> </u> P <u> </u> |
| TYPE | SP66-00410 | |

| SHIP No. | | SPARE PARTS LIST FOR | | U S E | | | SETS PER VESSEL |
|------------|------------------|---|--|---------------------------|----------|----------|---|
| | | CI-60 カラー潮流観測装置 CI-60G DOPPLER SONAR CURRENT INDICATOR | | FOR 200VAC用 | | | |
| ITEM No. | NAME OF PART | O U T L I N E | DWG. No. OR TYPE No. | QUANTITY | | | REMARKS/CODE No. |
| | | | | WORKING | | SPARE | |
| | | | | PER SET | PER VES. | | |
| 1 | ミゼットヒューズ FUZE |  | FGMB 0.5A AC125V | 1 | | 3 | 指示器用 FOR DISPLAY UNIT 000-114-994 |
| 2 | 管入りヒューズ FUZE |  | FGMB-A 5A AC125V | 2 | | 6 | 指示器用 FOR DISPLAY UNIT 000-549-064 |
| 3 | 管入りヒューズ FUZE |  | FGBO 7A AC125V OR JSO 7A 125V | 3 | | 5 | 送受信演算部用 FOR TRANSCEIVER UNIT 000-549-013 |
| 4 | 管入りヒューズ FUZE |  | FGBO-A 1A AC125V OR JSO 1A 125V | 1 | | 3 | 送受信演算部用 FOR TRANSCEIVER UNIT 000-549-061 |
| 5 | 管入りヒューズ FUZE |  | FGBO-A 3A AC125V OR JSO 3A 125V | 1 | | 3 | 送受信演算部用 FOR TRANSCEIVER UNIT 000-549-063 |
| 6 | 管入りヒューズ FUZE |  | FGBO-A 5A AC125V OR JSO 5A 125V | 1 | | 3 | 送受信演算部用 FOR TRANSCEIVER UNIT 000-549-064 |
| 7 | 管入りヒューズ FUZE |  | FGBO 10A AC125V | 1 | | 3 | 送受信演算部用 FOR TRANSCEIVER UNIT 000-549-065 |
| 8 | 管入りヒューズ FUZE |  | FGBO 10A AC250V | 2 | | 4 | 送受信演算部用 FOR TRANSCEIVER UNIT 000-549-067 |
| | | | | | | | |
| | | | | | | | |
| MFR'S NAME | | | | FURUNO ELECTRIC CO., LTD. | | DWG. No. | C 7 2 2 8 - P 0 2 - C |

CHAPTER 1 GENERAL DESCRIPTION

The Doppler Sonar Current Indicator CI-60/G consists of a Display Unit, a Transceiver Unit, a Junction Box and a Hull (Transducer) Unit. To obtain absolute tide even in deep waters, the CI-60G must be supplied with the speed/course data (or position data) from a navigation equipment (GPS), and the heading data from a gyrocompass (via an A-D converter). The equipment can output ship's speed and true bearing data to a radar or scanning sonar for true-motion display. Further, current data can be output to an echo sounder or scanning sonar in CIF format.

To obtain full performance from the equipment, the installation of the units, especially the hull unit, is very important. Poor siting of units or poor cable layout may cause pick-up of noise, or give interference to other units. This chapter presents an overview of how to install the equipment.

1.1 Selection of Installation Site

Hull (Transducer) Unit

The performance of the equipment largely depends on the installation of the transducer unit, and a very important consideration is the installation site. They should meet the following requirements.

- a) No projections (such as sonar's retraction tank) should exist in the hatched area shown in Fig. 1-1. However, when the transducer unit projects below the lowest part of the keel, the effects when the sonar transducer is lowered must be taken into account.

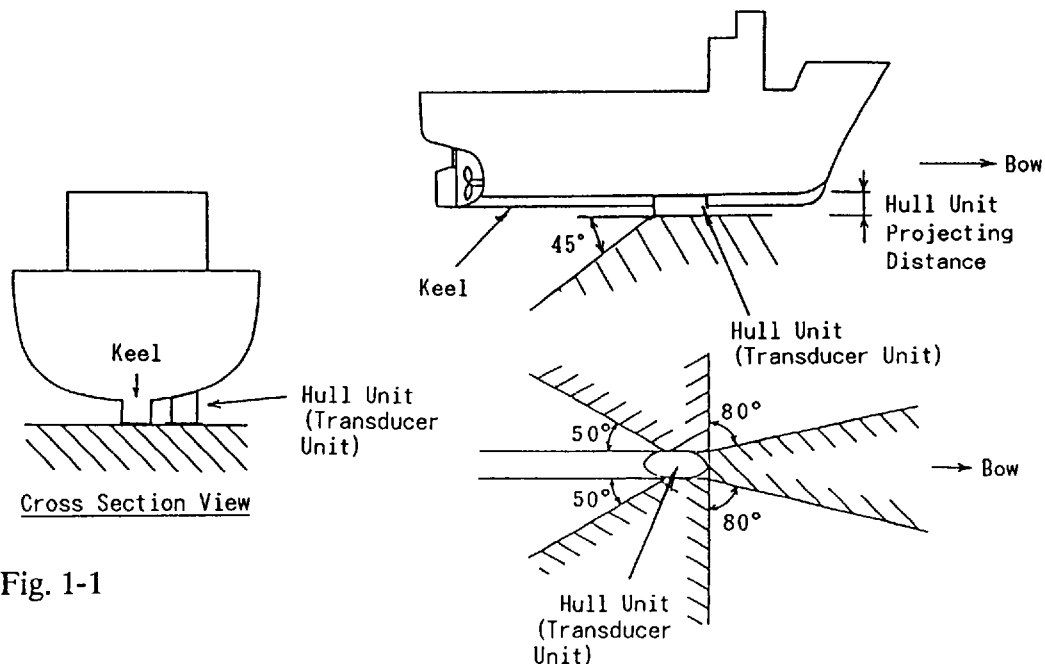


Fig. 1-1

- b) Mount the transducer between one-third and one-half of the ship's full length (measuring from the bow). Select the place where the transducer is free from the effects of air bubbles. The transducer face should not be above the sea surface when the ship is pitching or rolling.
- c) In general, the air bubbles produced at the bow flow backward alongside the keel. Therefore, separate the transducer by more than 1000 mm from the keel, or flush mount the transducer inside the keel. (See notes below.)
- d) The surface of the transducer should project by 250 mm or more from the hull bottom. For better performance, its surface should be even with the keel's lowest point or below it.
- e) The following is important for preventing interference between the CI-60/G and other equipment(s).
If the transducer of an echo sounder or scanning sonar whose harmonic is within the frequency range of 236kHz to 252kHz ($244 \pm 8\text{kHz}$) is mounted, interference may occur. Even if the harmonic is out of the range, the risk of interference still exists if the transducer of the CI-60/G and other equipment(s) are mounted near one another. For this reason, separate the transducer of the CI-60/G as far as practical from other equipments which have high output power. If interference is unavoidable due to limited mounting space, connect the interfering equipment to the built-in interference rejector circuit (two inputs) in the transceiver unit. For connection to this circuit, you will need to run a two core cable between it and the interfering equipment(s).
- f) Make the transducer cable as short as possible. The cable is generally installed in grounded steel conduit run between the transducer and the junction box, to prevent pick-up of noise. The transducer with 20 m transducer cable can be used only when it is passed inside conduit.

Note 1: For flush mounting, provision must be made to allow water to flow inside the transducer to keep it cool.

Note 2: Before installing the hull (transducer) unit, discussion should take place and agreement be reached with the shipyard for sufficient reinforcement and watertightness of the hull and keel to comply with the regulations concerned.

Other Units

When selecting a mounting location for the other units (except transducer) of the CI-60/G system, keep the following in mind:

- a) Keep the units out of direct sunlight.
- b) Keep the units away from air conditioners and heaters.
- c) Avoid areas subjected to rain or water splash.
- d) Select a well-ventilated area.
- e) Avoid wet and dusty areas.
- f) Select a place where vibration is minimum.

1.2 Grounding

This equipment uses pulse signals which may cause interference to other electronic equipments such as direction finder and radio receiver, if it is not grounded properly. It is strongly recommended to ground all cables referring to the guidelines below.

- a) Separate all units as far as possible from radio equipment.
- b) Do not run interconnection cables close to or near radio equipment or its cables.
- c) Run the cables in the shortest path practical.
- d) Lay the cables on grounded copper plate and fix them every 30 cm with metal cable clamps.
- e) Ground all units with a copper strap as shown in Figs. 1-2 and 1-3.
- f) To join copper straps, use solder cream for perfect contact.

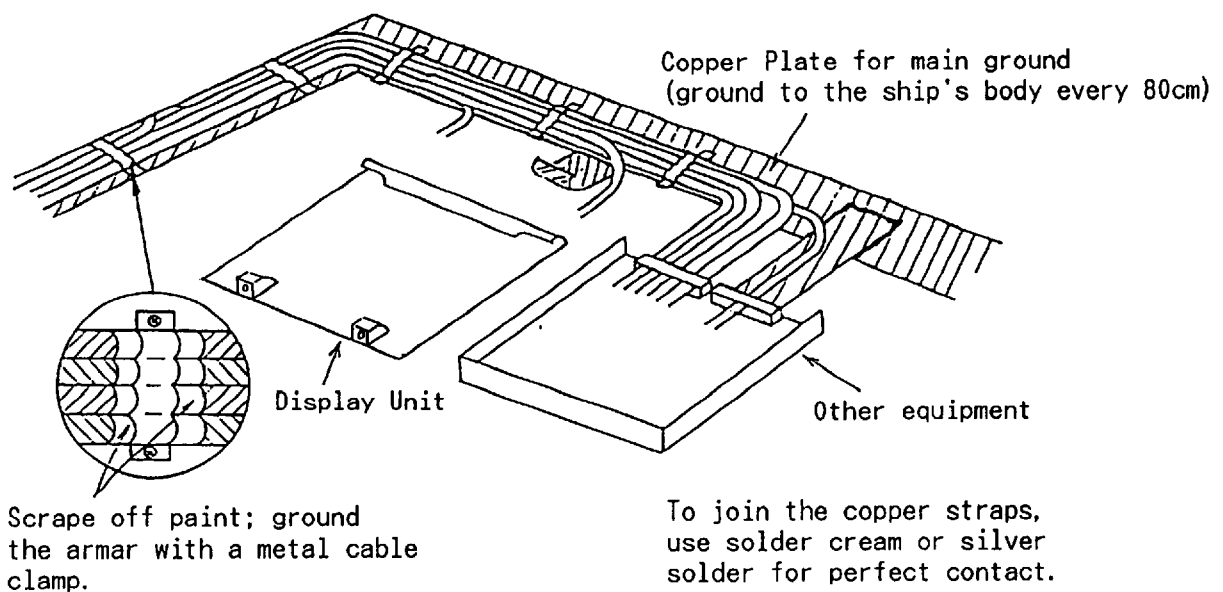
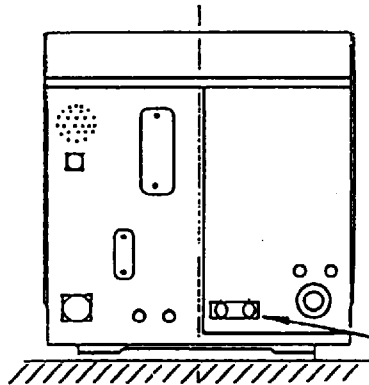




Fig. 1-2 Example of Grounding [1]

Location of earth terminal on each unit and grounding method

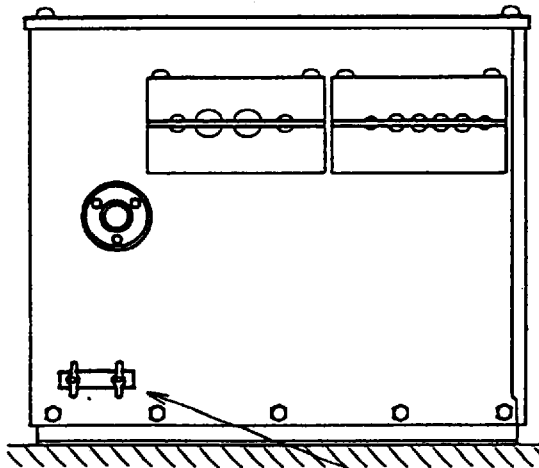
- Display Unit (Rear)



Fix copper strap (w=50mm) to earth studs by the two wing nuts.

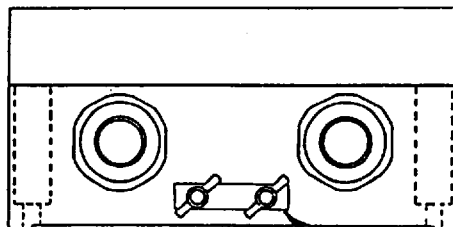
| | |
|--|--|
|  | CAUTION |
|  | Ground the equipment. Ungrounded equipment can give off or receive electromagnetic interference or cause electrical shock. |

- Transceiver Unit (Bottom)



Fix copper strap (w=50mm) to earth studs by the two wing nuts.

- Junction Box (Bottom)



Fix copper strap to earth studs by the two wing nuts.

Fig. 1-3 Examples of Grounding [2]

1.3 Alteration of Power Supply Voltage

1 ϕ , 50/60Hz AC power is supplied to the transceiver unit. The transformer tap is set at the factory according to customer's order. If necessary, change jumper wires at TB5 of the Transceiver Unit according to the input voltage.

⚠ CAUTION

Confirm that the power supply voltage is compatible with the voltage rating of the equipment.

Connection to the wrong power supply can cause fire or equipment damage. The voltage rating appears on the label at the rear of the equipment.

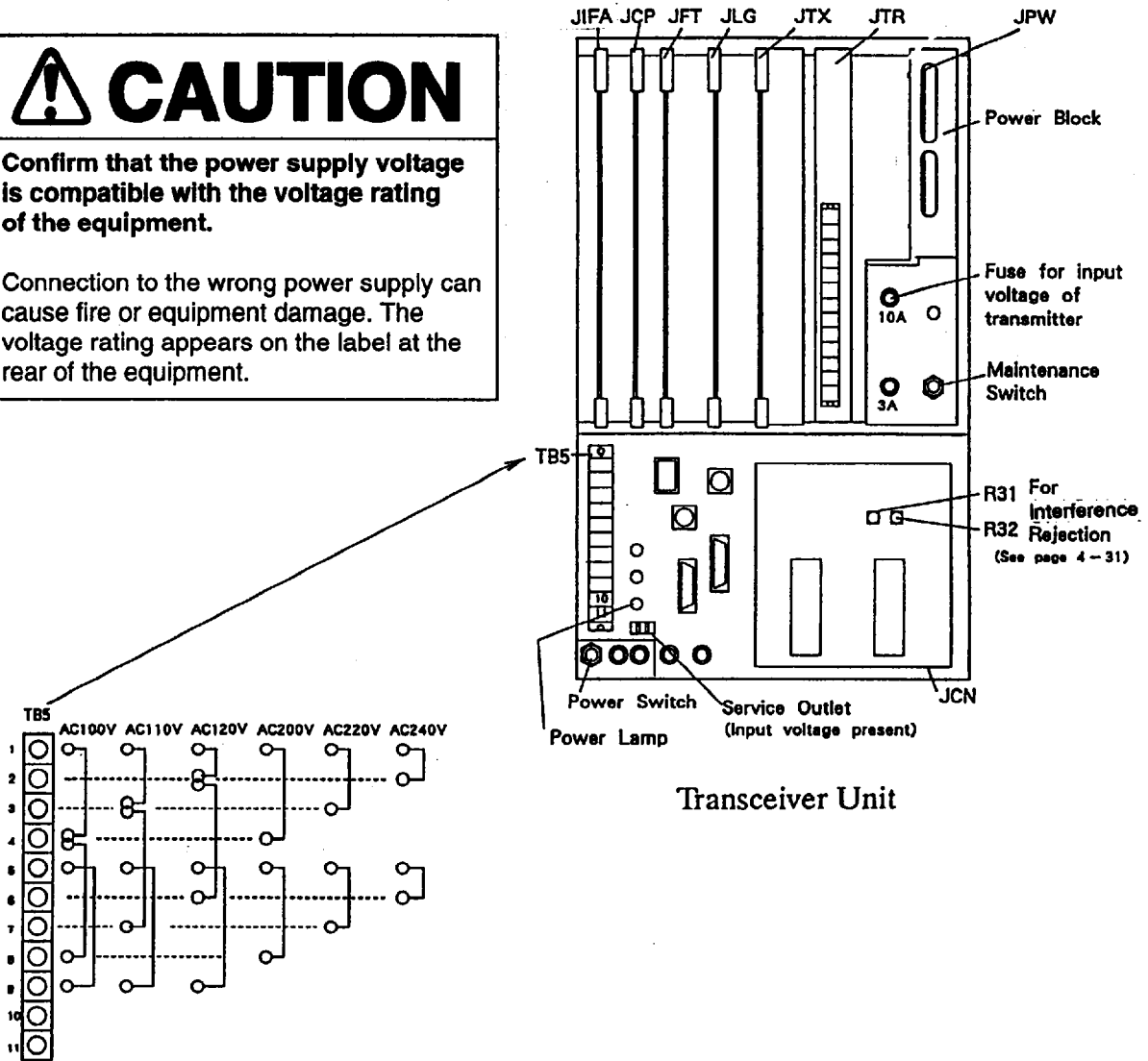


Fig. 1-4 Jumper Connections for Mains Voltages

Example: For 220 VAC input, put jumpers between terminals 1 and 3, and 5 and 7.

CHAPTER 2 MOUNTING

2.1 Display Unit

Mounting Considerations

The display unit is designed for tabletop mounting. It can be installed almost anywhere, provided the following conditions are met.

- 1) Select a place where controls can be easily operated while observing fishing ground or the area around the vessel.
- 2) Locate the unit at least 1 m from magnetic devices (radar magnetron, loudspeaker, high power transformer, etc.) and magnetic compass.
- 3) Keep the unit out of direct sunlight, water splashes and hot air.
- 4) Secure enough space around the unit for maintenance, checking and ventilation, referring to the outline drawings.
- 5) Select a place where the CRT face is within $\pm 45^\circ$ from vertical.

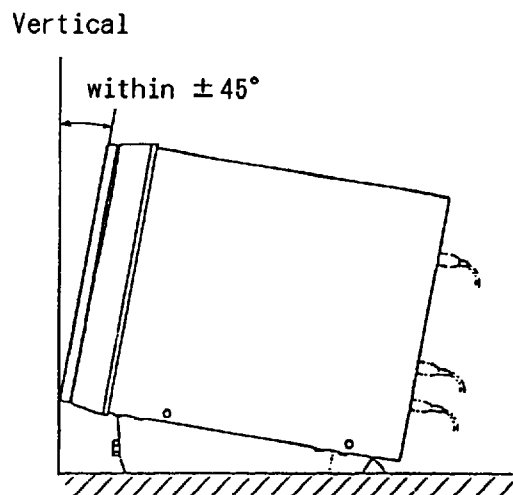


Fig. 2-1

Procedure

1. Remove the mounting base from the display unit by loosening the two bolts at the front of the display unit.
2. Fix the mounting base to the chosen location with four woodscrews ($\phi 10 \times 25$) or four bolts (M10).

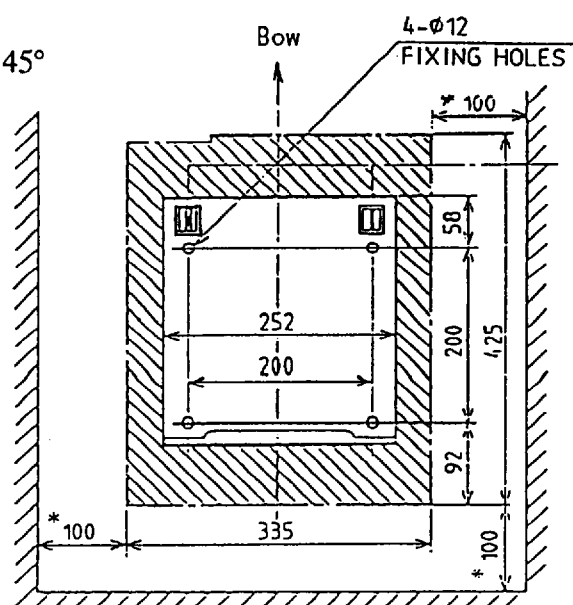


Fig. 2-2 Display Unit Mounting Dimensions

3. Fix the display unit to the mounting base with the two bolts removed in step 1.

2.2 Transceiver Unit

Mounting Considerations

- 1) Since the transceiver unit generates heat, install it in a dry, well-ventilated place. The cooling fans at the top of the unit must not be obstructed, to allow heat to escape.
- 2) This unit is designed for bulkhead mounting to permit dissipation of heat. If bulkhead mounting is absolutely impossible, mount the unit on the floor leaving at least 50 mm clearance between it and the floor to permit dissipation of heat.
- 3) The unit weighs 32 kg. Reinforce the mounting area, if necessary.
- 4) Leave space around the unit for maintenance and checking. Refer to the drawing on page D-2.

Procedure

1. Fix 4 bolts (M10) to the bulkhead so their ends are exposed by about 20 mm. Attach a nut to each bolt to provide clearance between the rear panel of the unit and the bulkhead to prevent warpage of the rear panel. If it warps, it may be impossible to remove the power block in the transceiver unit.

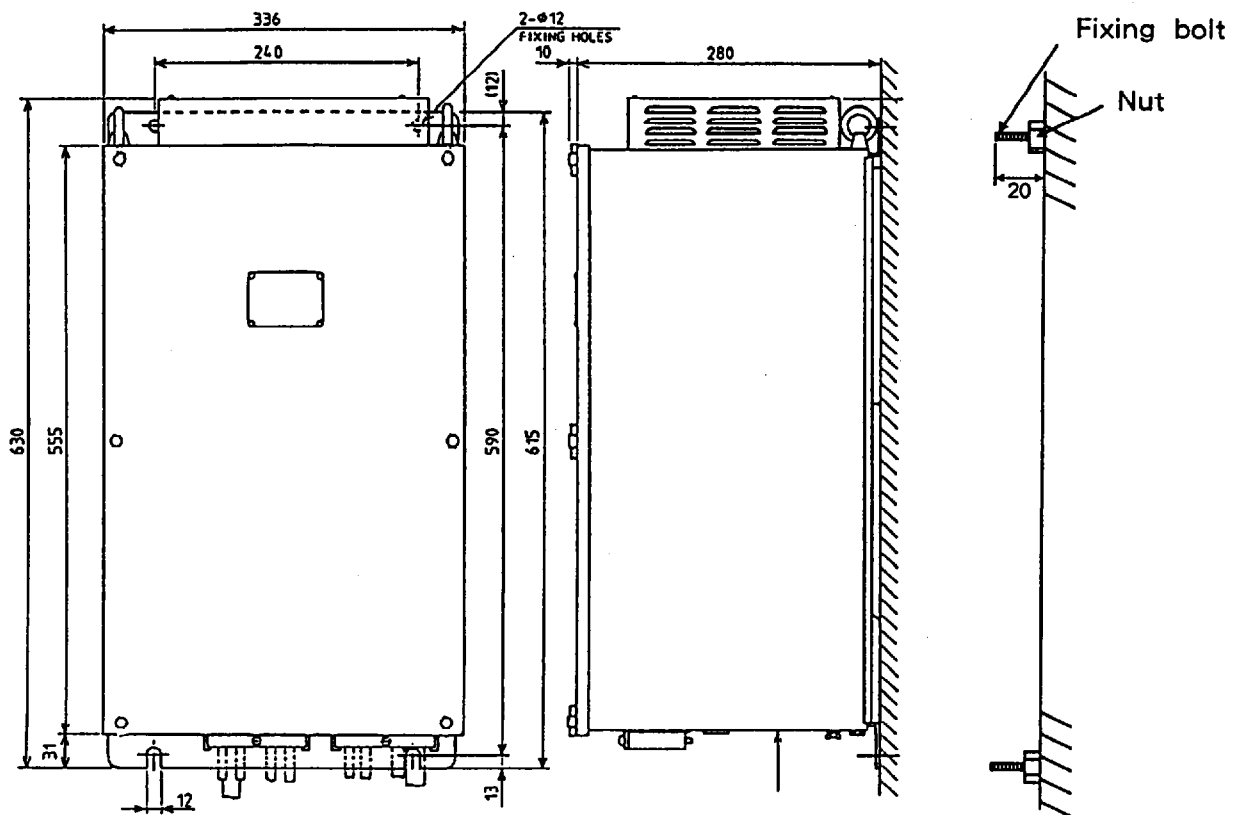


Fig. 2-3 Transceiver Unit Mounting Dimensions (Vertical Mounting)

2. Place the transceiver unit on the bulkhead and fix it with nuts.

2.3 Junction Box

Mounting Considerations

The junction box forms a joint between the hull unit and the transceiver unit. Install it referring to the guidelines below.

- 1) Keep the junction box away from noise emitting electrical machinery, i.e., electric generator, radio transmitter, TV, etc.
- 2) Although the box is splashproof, do not install it in places of high humidity.
- 3) Avoid installing the box where temperature varies greatly, since moisture may penetrate the box.
- 4) The box is generally installed above the draft line of the ship and the transducer cable is run inside steel conduit. This permits replacement of the transducer without dry docking. Even if the junction box is installed below the draft line, the conduit is necessary to minimize picking up of noise. If use of conduit is not possible, install the box as near to the transducer as possible.

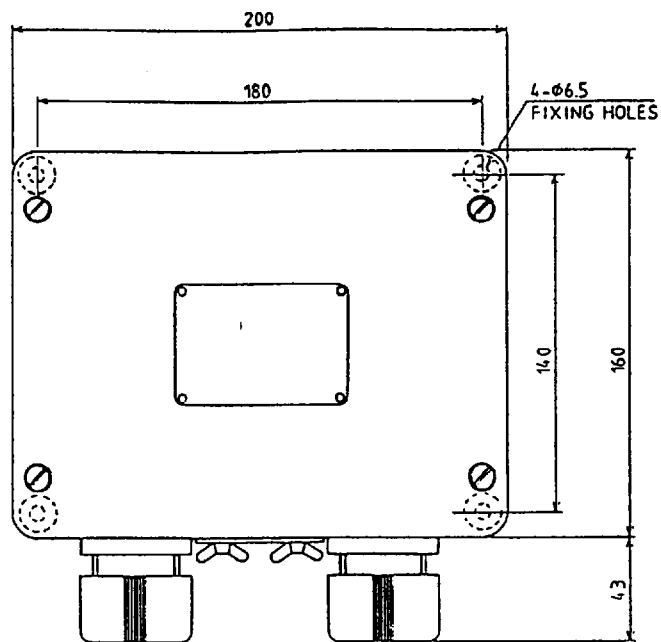


Fig. 2-4 Junction Box Mounting Dimensions

Procedure

Fix the junction box to a bulkhead, referring to Fig. 2-4.

2.4 Hull (Transducer) Unit

Steel Hull Vessels (See page D-4)

1. Select a mounting place on the hull bottom, referring to chapter 1. (Since the transducer cable is comparatively thick, select a mounting place for the thru-hull pipe where the cable can be easily led into the cable gland.)
2. If necessary, weld a doubling plate (shipyard supply) to the hull bottom.
3. Unpack the transducer casing and determine the projecting length, making it 250 mm or more. Before cutting the casing, confirm that the transducer casing has "direction". Then, cut it considering the rising angle of the ship's hull.
Weld the casing in parallel with ship's fore-aft line with an accuracy of better than $\pm 1^\circ$.
The transducer face should be horizontal at cruising speed.
4. Make a hole for the thru-hull pipe in the hull bottom. Before welding the thru-hull pipe, remove the rubber packing from the thru-hull pipe. Weld the thru-hull pipe. Replace the rubber packing.
5. Make a hole of 10 to 20 mm diameter on the stern side of the casing to allow water to penetrate the transducer casing.
6. Weld the casing to the hull bottom. Do not remove the transducer fixing flange to prevent the casing from being deformed.

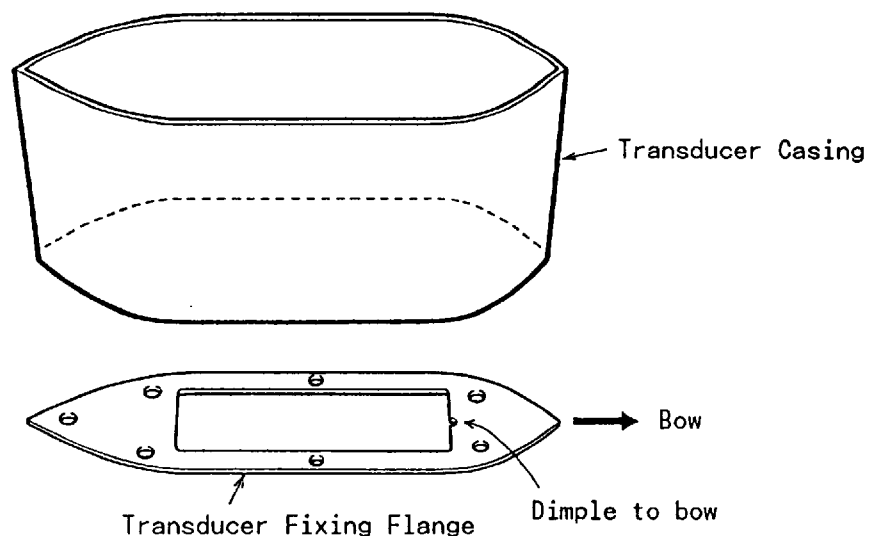


Fig. 2-5 Fixing Transducer Casing

7. Dismount the fixing flange from the casing. Fix the transducer to the fixing flange.

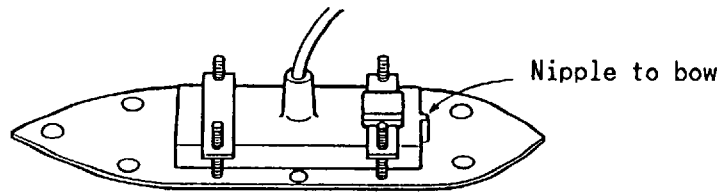


Fig. 2-6

8. Pass the transducer cable through the thru-hull pipe. Tighten the cable gland, leaving a cable slack of 0.5 to 1 m below the cable gland.

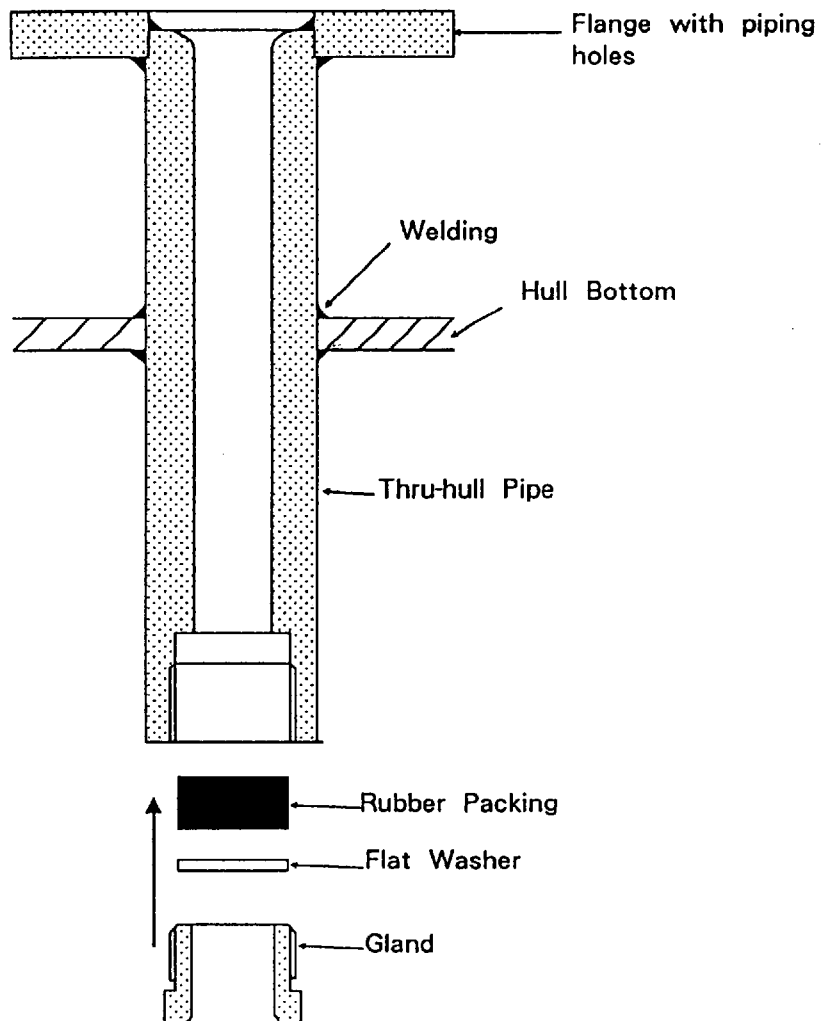


Fig. 2-7 Thru-hull Pipe for Steel Hull

9. Mount the fixing flange with the transducer onto the casing. Take care not to pinch the transducer cable. Never hold the transducer by the cable. Shock will most assuredly damage the transducer.

FRP Hull Vessels (See page D-5)

1. Select a mounting place on the hull bottom, referring to chapter 1. (Since the transducer cable is comparatively thick, select a mounting place for the thru-hull pipe where the cable can be easily led into the cable gland.)
2. Determine the projecting length of the casing, making it at least 250 mm. Cut the casing, considering the rising angle of the ship's hull, so that the transducer face is horizontal. The casing should be parallel with ship's fore-aft line within $\pm 1^\circ$, and the transducer face should be horizontal at cruising speed.
3. Make a hole of 10 to 20 mm in diameter on the stern side of the casing to allow water to penetrate the transducer casing.
4. Make a hole for the thru-hull pipe on the hull bottom. Allow enough clearance around the pipe for easy tightening of lock nuts.
5. Fix the thru-hull pipe on the hull plate with double nuts and then apply FRP glue around the pipe.
6. Before fixing the casing to the hull bottom, clean the hull plate surface with an electric sander until fiberglass appears, then remove dusts, oils, etc. from surface. Reinforce both sides of the casing with FRP molding.
7. Fix the transducer to the fixing flange.

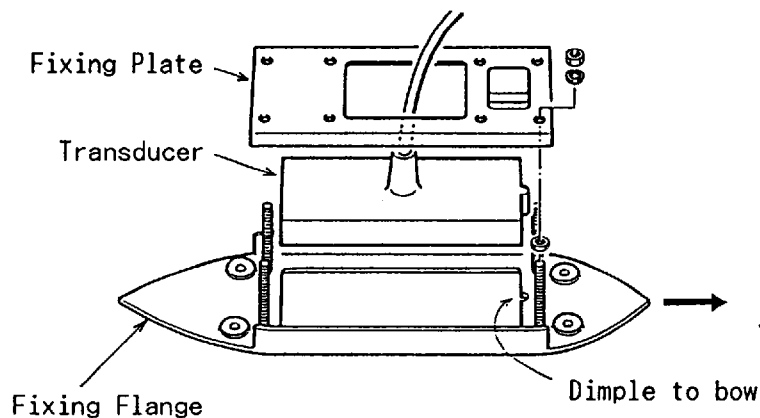


Fig. 2-8

8. Pass the transducer cable through the thru-hull pipe. Tighten the cable gland, leaving a cable slack of 0.5 to 1 m below the cable gland.

To tighten the cable gland;

- a) Tighten the gland securely.
- b) Tighten the double nut securely.

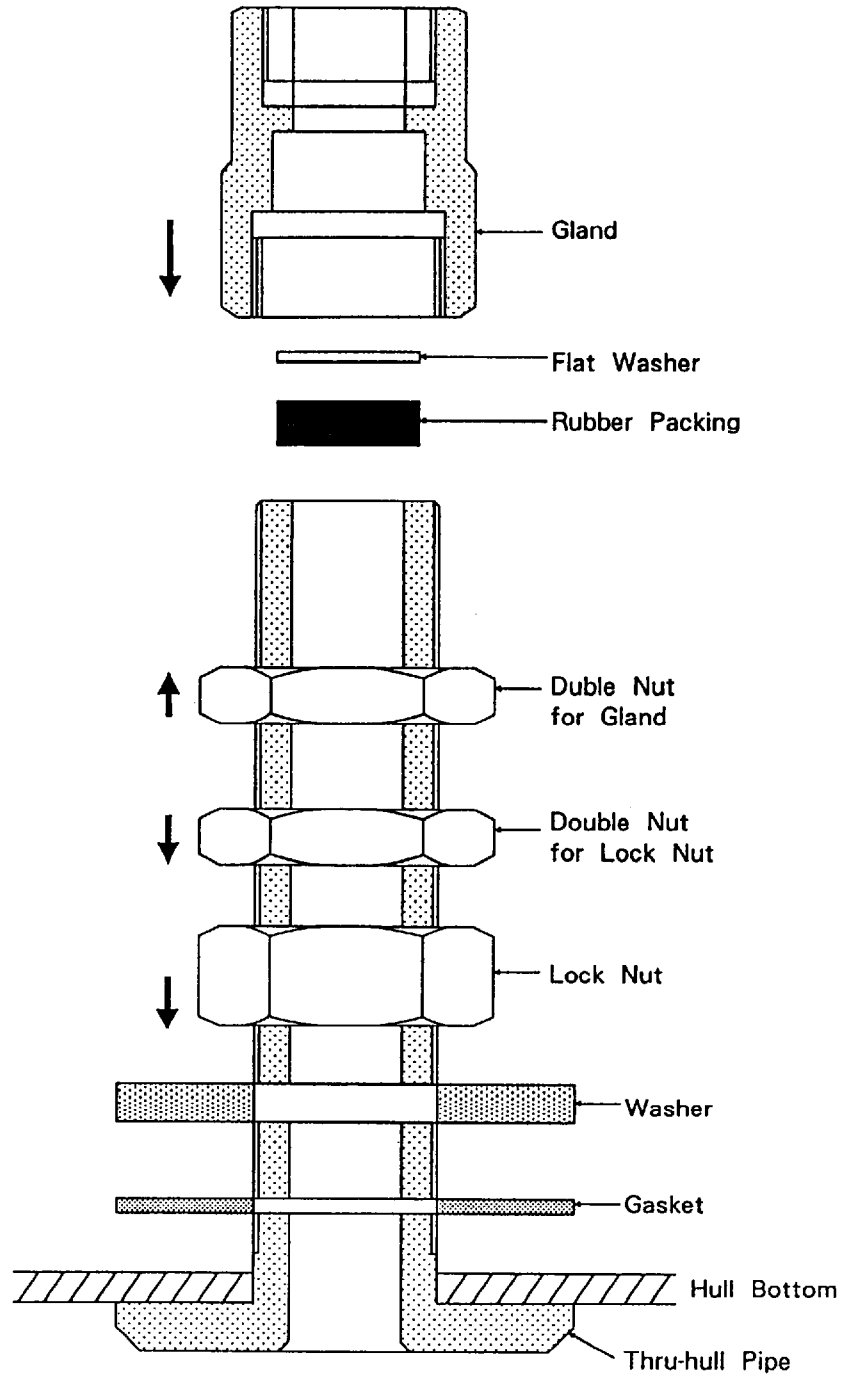


Fig. 2-9

9. Fix the fixing flange with the transducer to the casing. Take care not to pinch the transducer cable.

2.5 DC-AC Inverter

If the ships mains is 24 VDC or 32 VDC a DC-AC inverter is required. Two models are available; TR-2450, 24/32 VDC, and CSH-5050, 32 VDC. For the CSH-5050, change the tap connection for 32 VDC. For further information, see the instruction sheet attached to the CSH-5050. Never share the output of the DC-AC Inverter with other equipment(s).

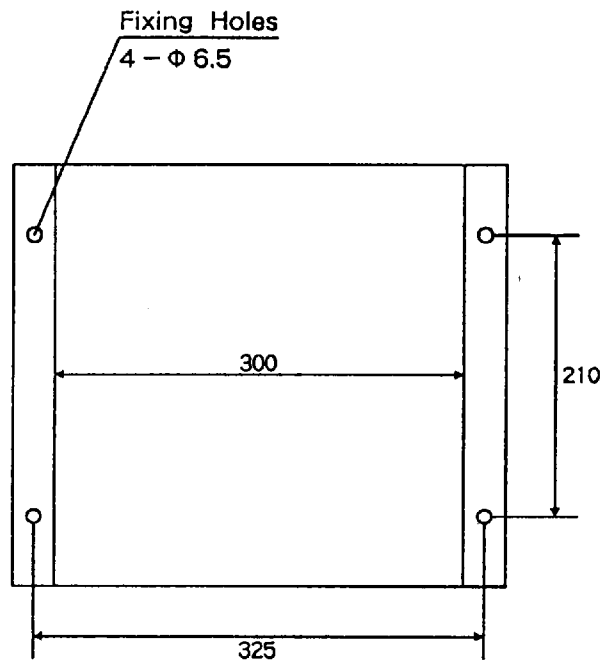


Fig. 2-10 TR-2450 Mounting Dimensions

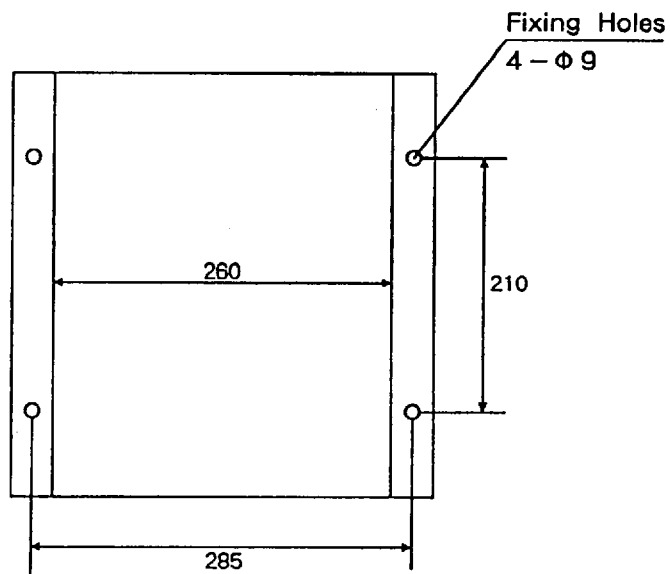
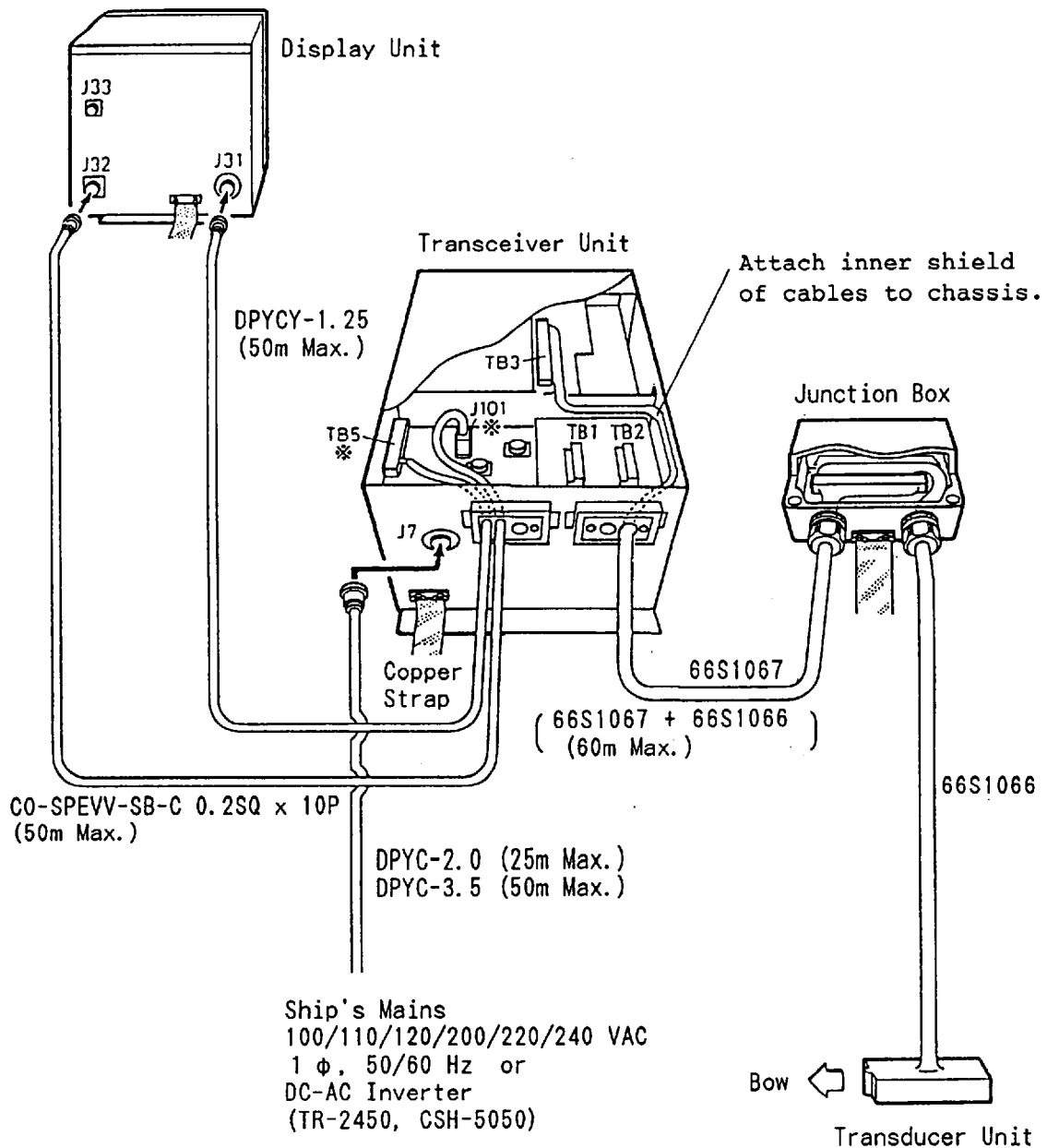


Fig. 2-11 CSH-5050 Mounting Dimensions

CHAPTER 3 CONNECTIONS

3.1 Cabling

Connect cables referring to the figure below.



※ : Prefitted with connector and crimp-on lugs.

Fig. 3-1 Cabling

3.2 Display Unit

Two cables run from the transceiver unit: a power cable and a signal cable. Fit a connector to each as shown below.

1) Power cable P66-1-10/20/30 (DPYCY-1.25)

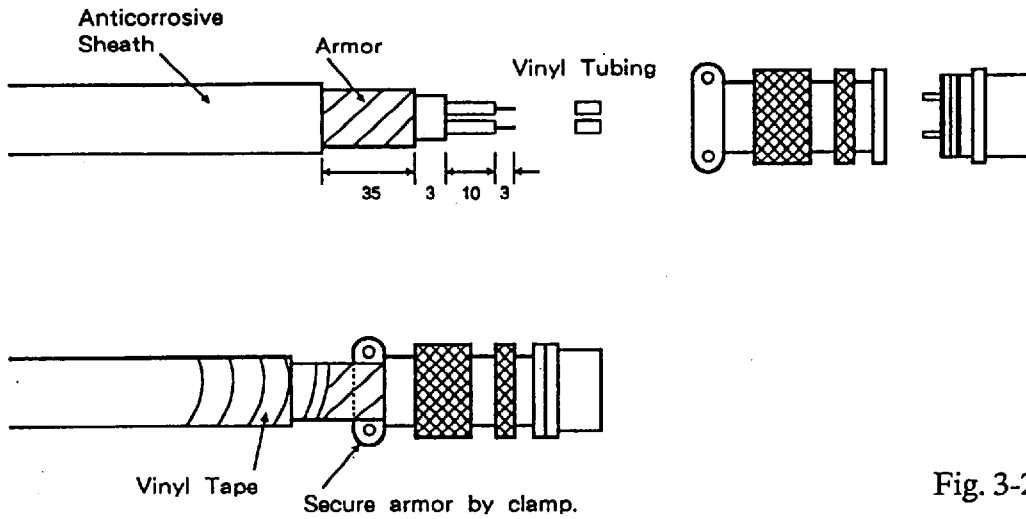


Fig. 3-2

2) Signal cable S66-4-10/20/30 (CO-SPEVV-SB-C 0.2sq × 10p)

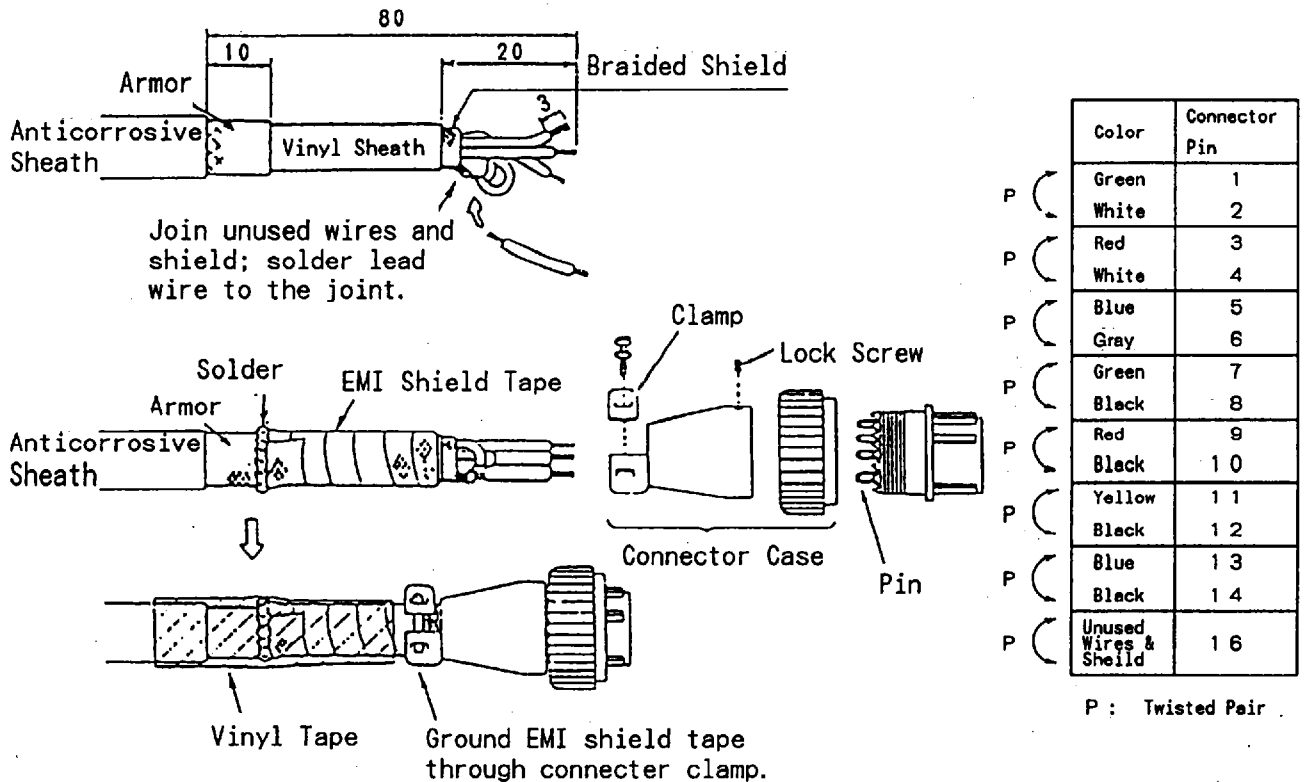
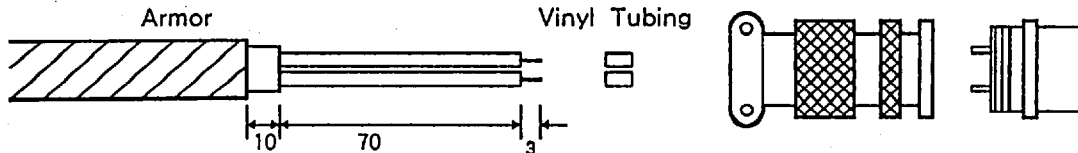


Fig. 3-3

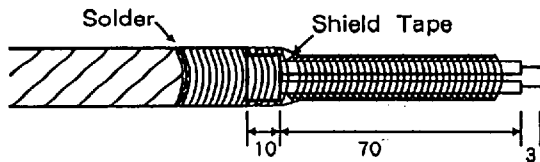
3.3 Transceiver Unit

A power cable and a 4 pair cable (transducer line) run between the transceiver unit and the display unit. They are outfitted with a connector and crimp-on lugs; but you need to ground the armor and fabricate the other end of the cable for connection to the junction box.

- 1) Power cable DPYC-2.0 (max. 25 m) or DPYC-3.5 (max. 50 m)
(DPYC-xx is the Japan Industrial Standard cable. Refer to page 3-12.)



- In case of DPYC-3.5



- In case of DPYC-2.0, the cable fabrication is same as figure 3-2.

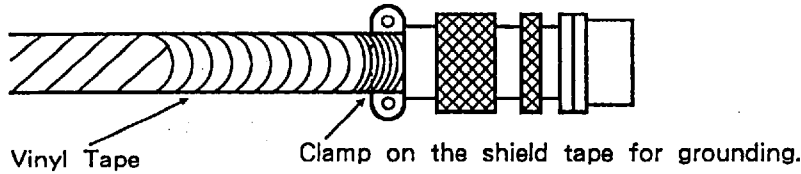


Fig. 3-4

- 2) 4 pair cable (66S1067, transducer line)

CAUTION

Carefully connect the wires to respective terminals, referring to the illustrations (next page) and the interconnection diagram (page S-1). Wrong connection can damage the transducer, thermal sensor and the JTX board.

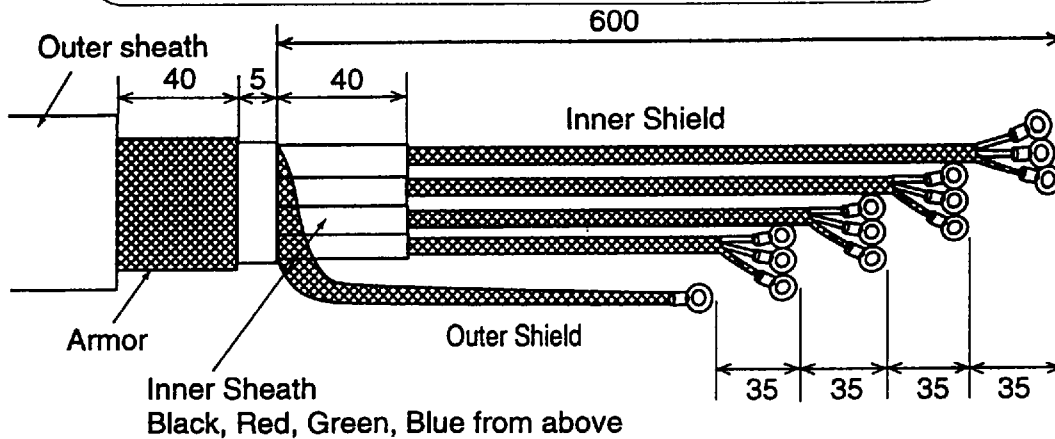


Fig. 3-5

Cabling of 66S1067 inside of the unit

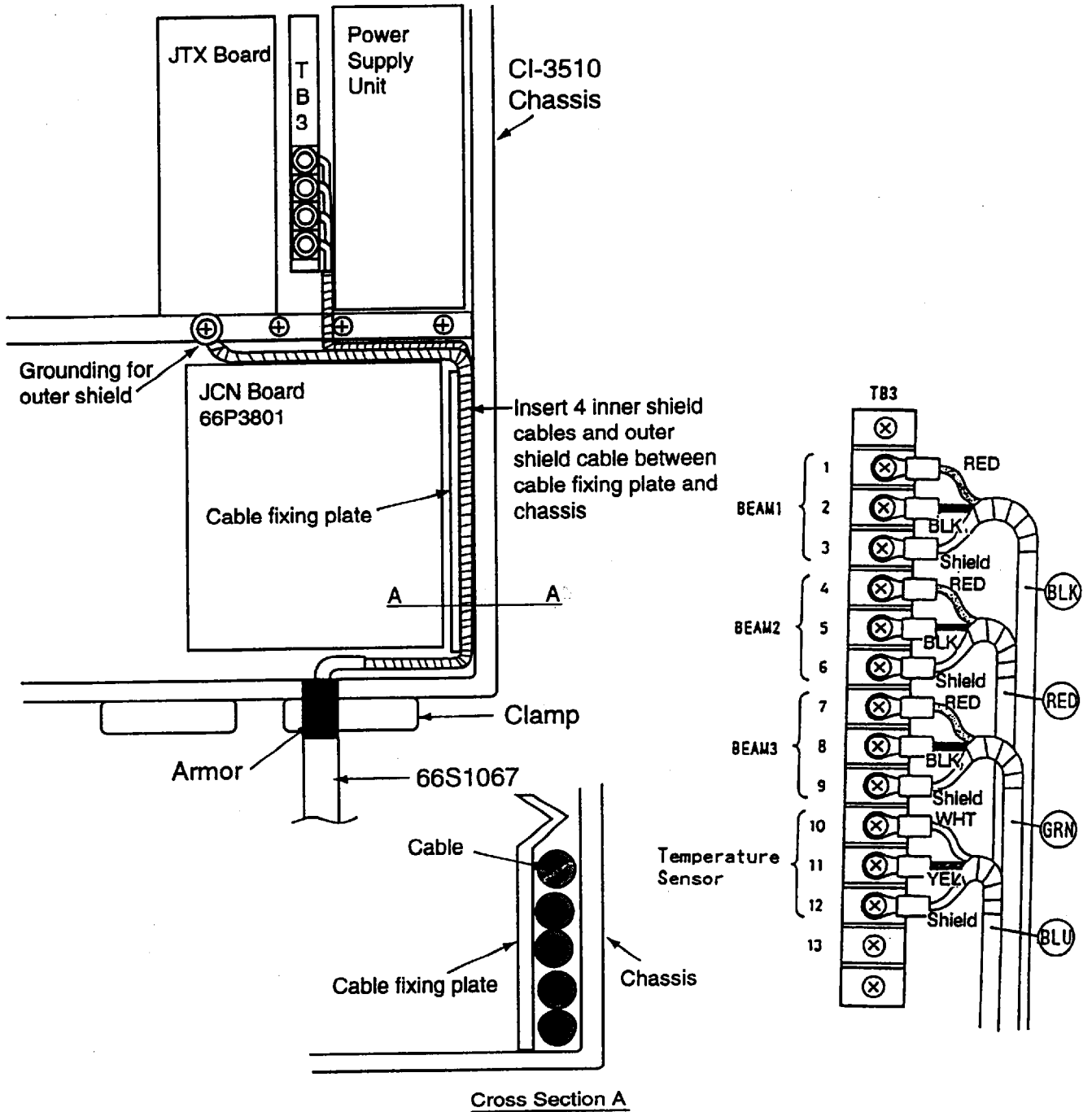


Fig. 3-6

3) Two cables run between the display unit and the transceiver unit.

The transceiver unit "end" of the cables is fitted with a connector and crimp-on lugs; however, you will need to fabricate the armor. See the previous section to fabricate the armor.

3.4 Junction Box

The transducer cable is connected to the junction box with an extension cable. After making the connection, seal the cable gland with putty for watertightness.

1) Transducer cable 66S1066 (without armor)

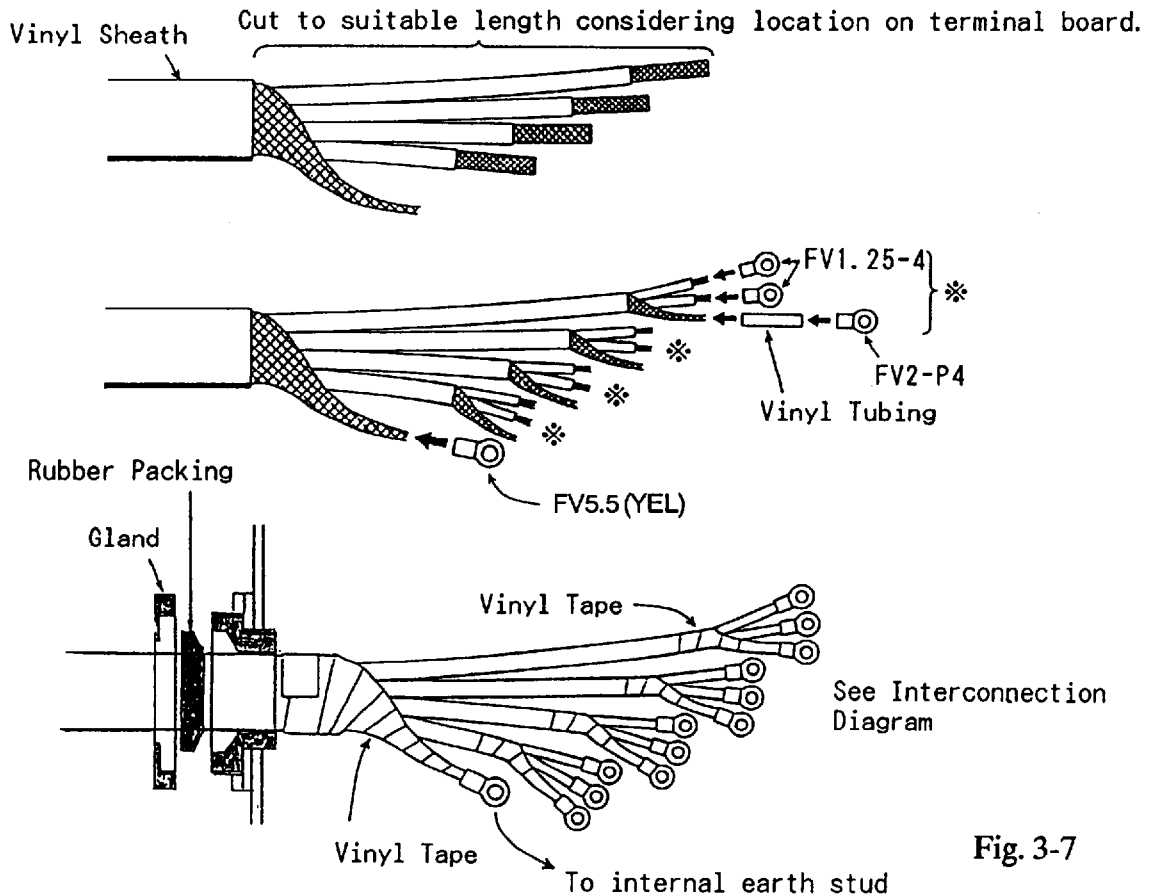


Fig. 3-7

2) 4 pair cable 66S1067 (extension cable, with armor)

Attach crimp-on lugs in the same manner as shown above. Fabricate the armor as follows.

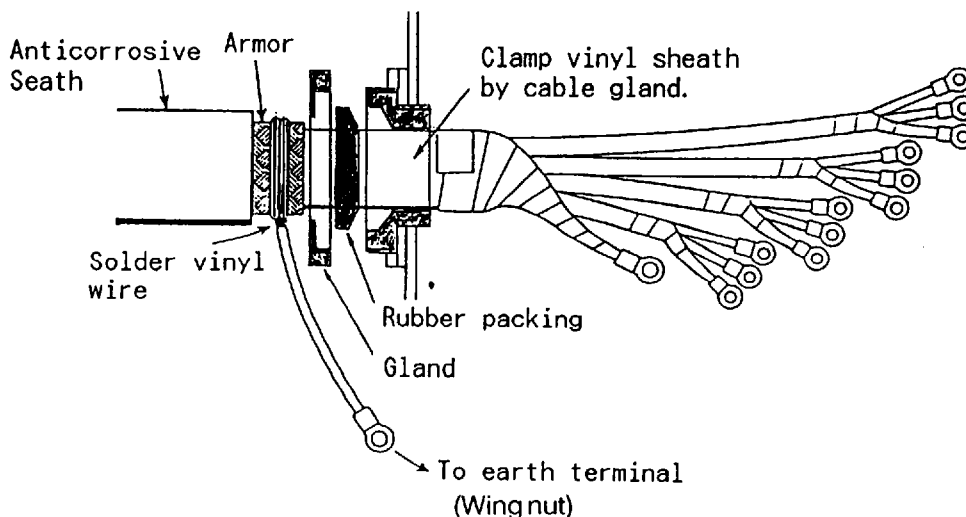


Fig. 3-8

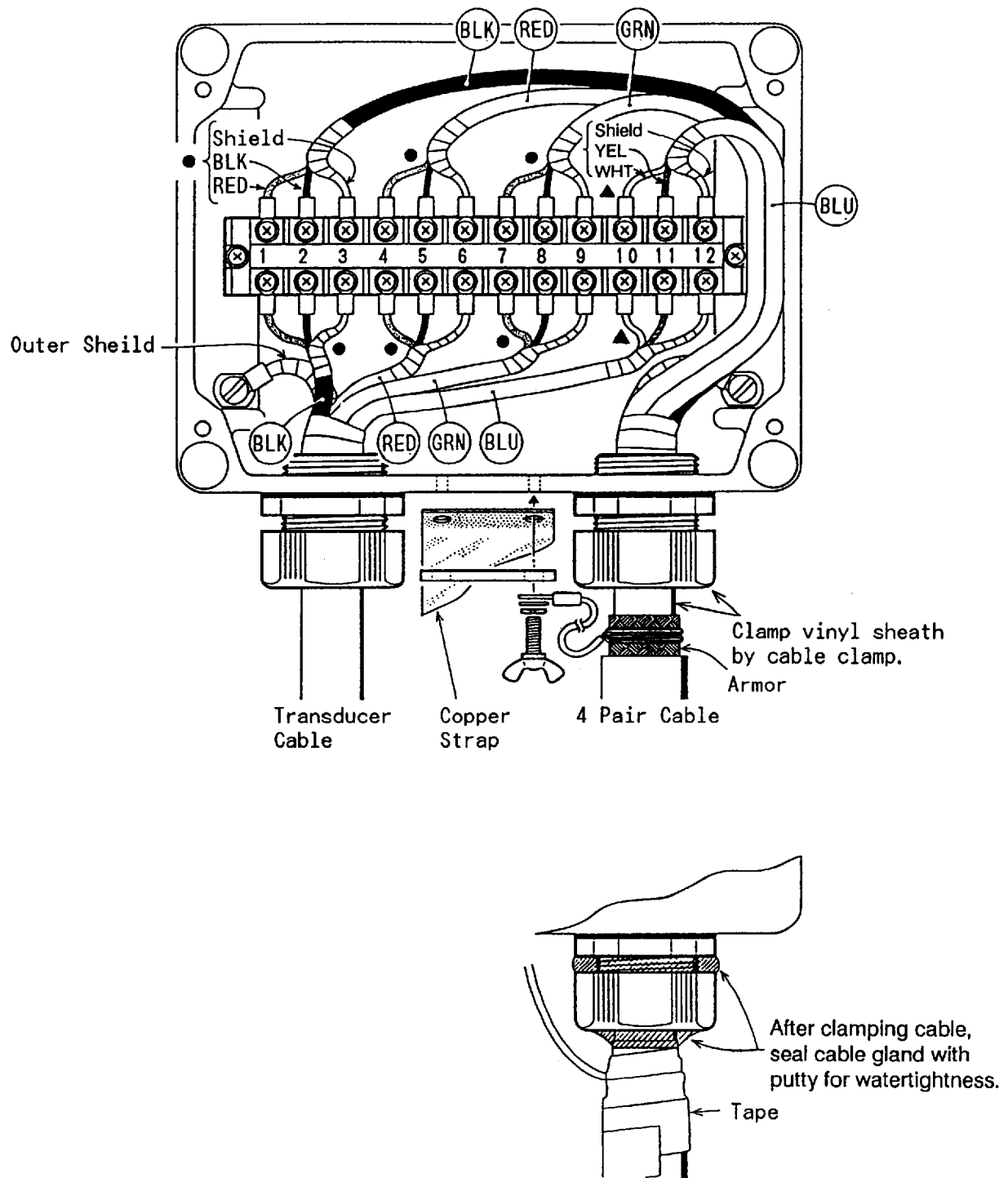


Fig. 3-9 Junction Box Inside View

3.5 External Equipment

3.5.1. Connection of external equipment to the display unit

A trumpet speaker and/or buzzer can be connected to the display unit for an external alarm. The trumpet speaker (4 Ω, max output level 800mW) is connected directly to pins A and B of connector J33. Contact closure signal for alarm is output from pins C and D of J33. Speaker volume is adjustable by R28 on the ICP board.

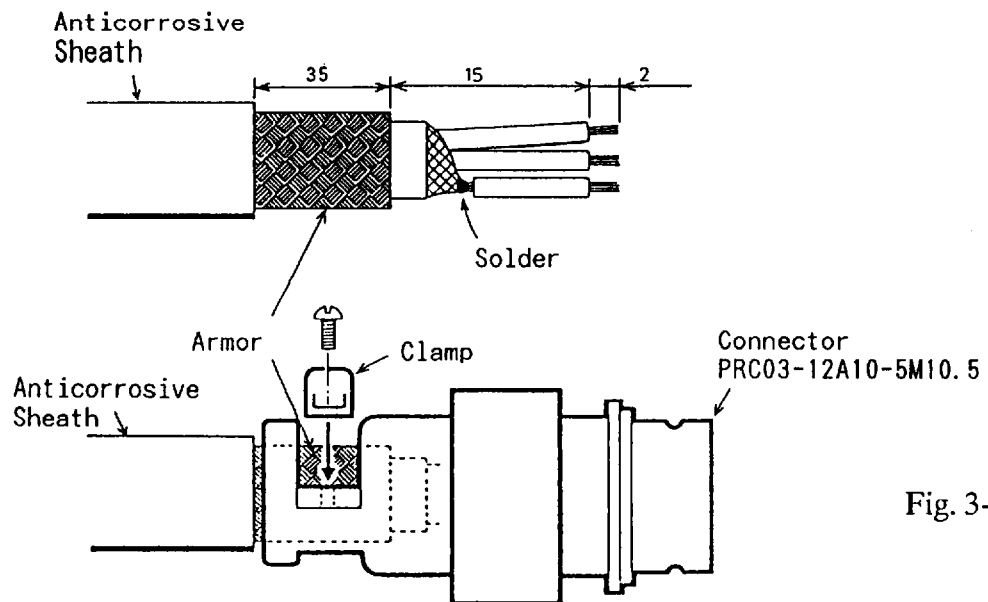
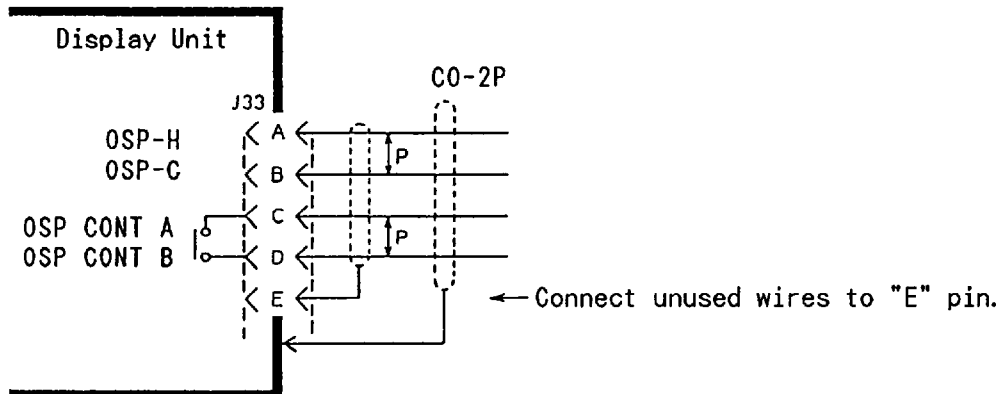
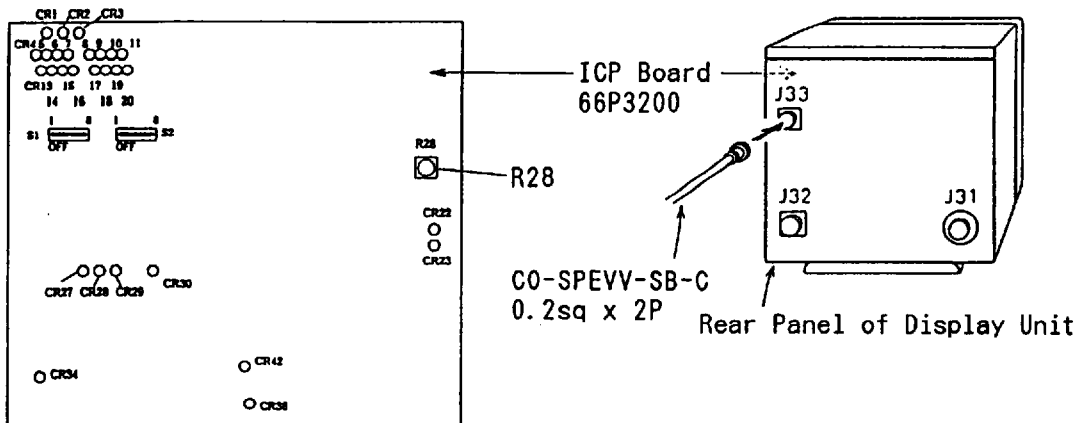
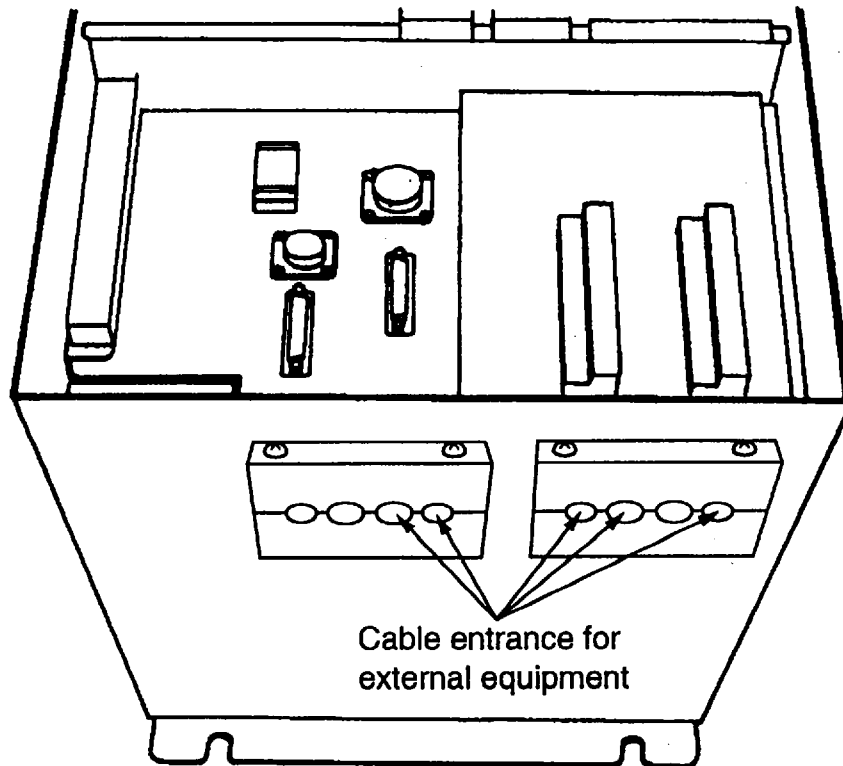


Fig. 3-10

3.5.2. Connection of external equipment to the transceiver unit



*Cable clamp can be fitted in any direction.

Fig. 3-11 Cable Entries for External Equipment

1) Signal cables for external KP and 200p/nm (CO-SPEVV-SB-C 0.2sq × 2p)

- Process the anticorrosive sheath and armor as shown below:

a. For external KP signal

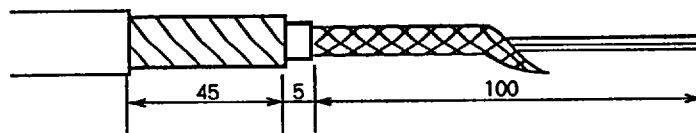


Fig. 3-12

b. For 200p/nm signal

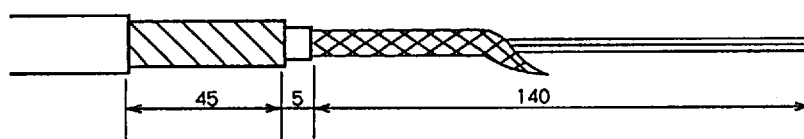


Fig. 3-13

● Fabrication of cores, shield and armor

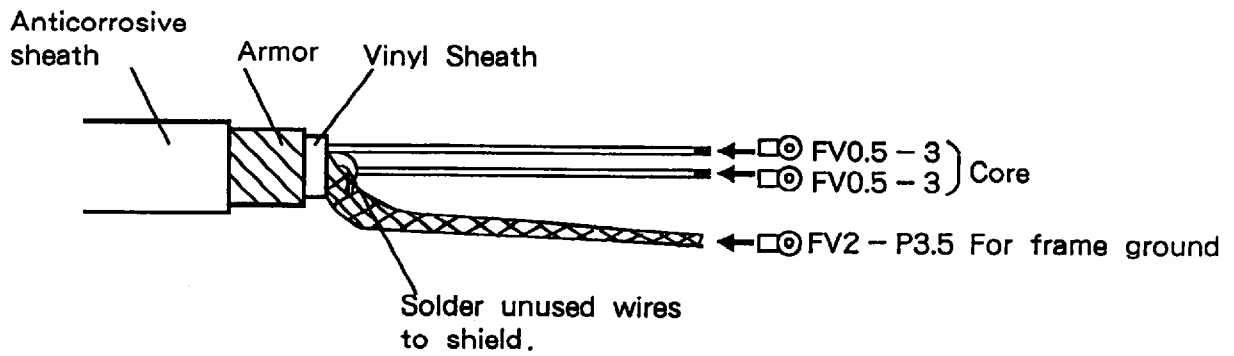


Fig. 3-14

● Fixing the cable

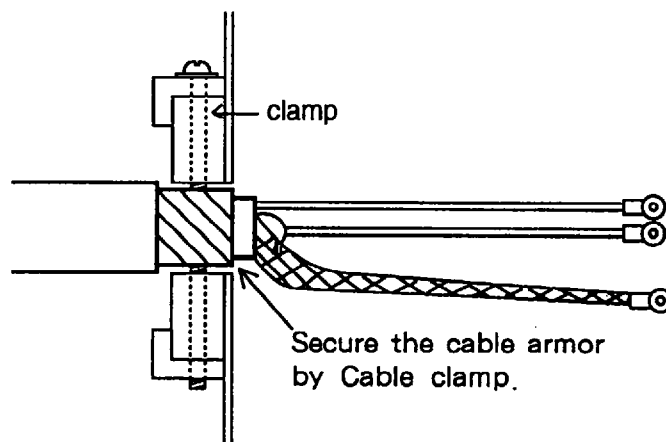


Fig. 3-15

2) Fabrication of the signal cables for gyro signal and true bearing (CO-SPEVV-SB-C 0.2sq × 5p)

- Process the anticorrosive sheath and armor as follows. Fabricate the cable in the same manner as above.

a) For gyro signal

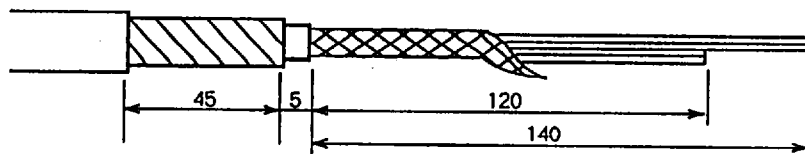


Fig. 3-16

b) For true bearing signal

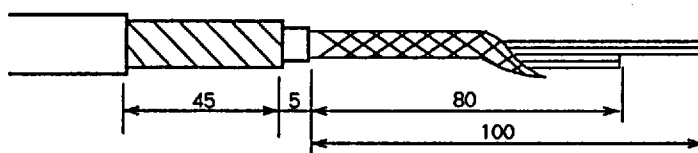


Fig. 3-17

3) Signal cable for CIF data (CO-SPEVV-SB-C 0.2sq × 5p)

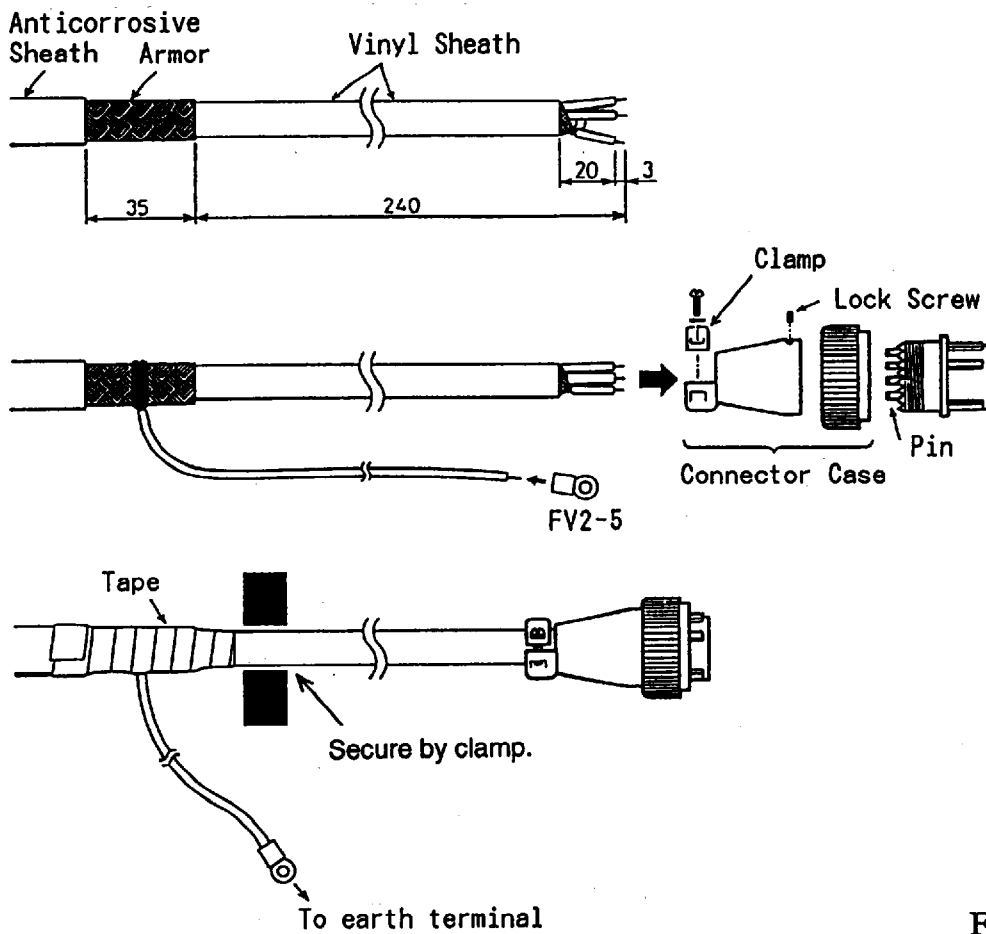


Fig. 3-18

4) Signal cable for NMEA data (CO-SPEVV-SB-C 0.2sq × 5p)

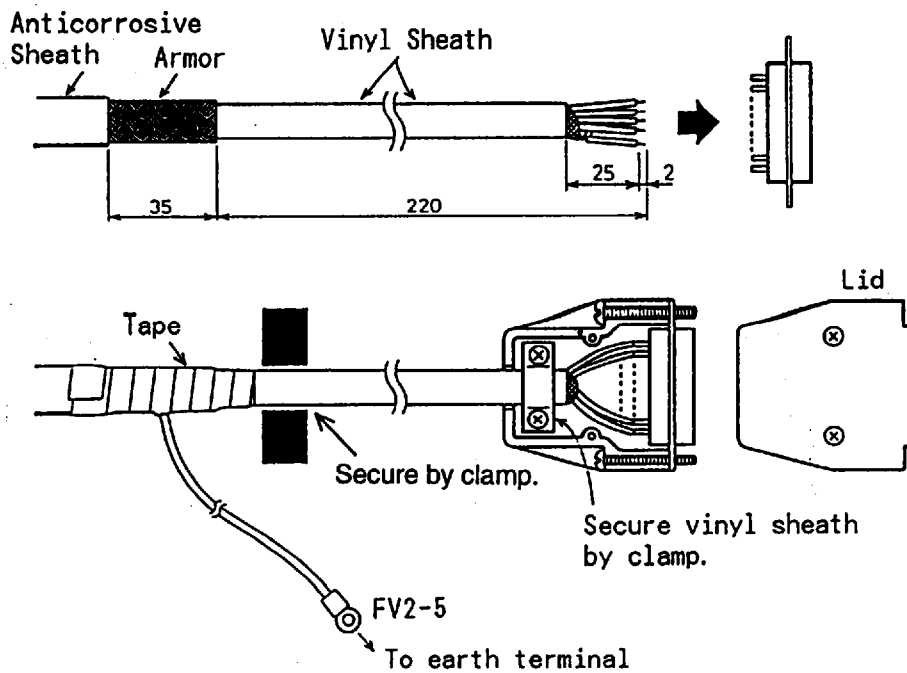
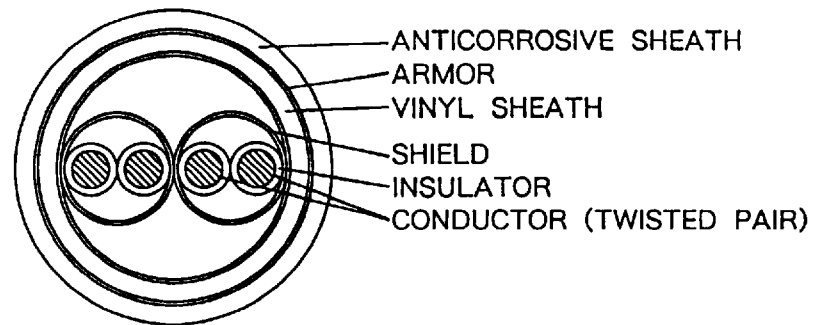


Fig. 3-19

5) Signal cable for distance indicator (TTYCY-2S)

- TTYCY-2S is Japan Industrial Standard (JIS) cable. Fabricate the cable as follows.



TTYCY-2S CABLE COMPOSITION

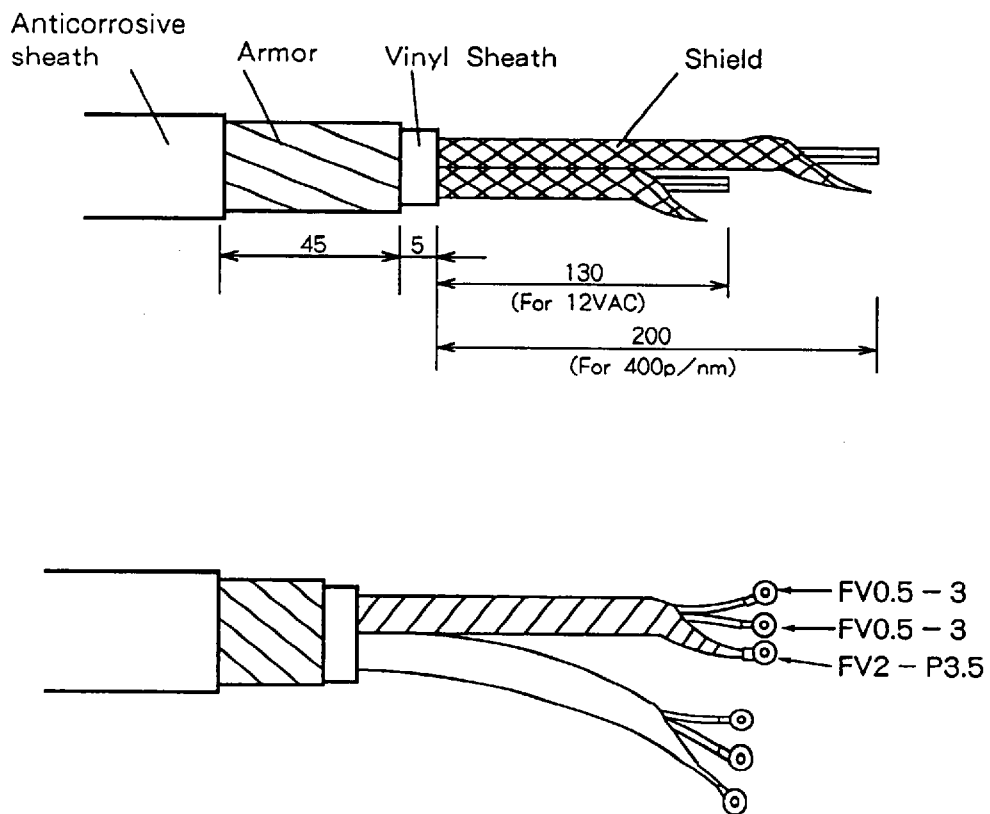


Fig. 3-20

3.6 DC-AC Inverter (TR-2450 or CSH-5050)

The cable connected between the ships mains and the DC-AC inverter and the transceiver unit and DC-AC inverter should meet the following requirements:

| Connection | Distance between units | Cable to use |
|-----------------------------------|------------------------|----------------------------|
| ship's mains ← DC-AC Inverter | less than 10 m | 660V-DPYC-8 |
| | more than 10 m | larger diameter than above |
| transceiver unit ← DC-AC Inverter | less than 25 m | DPYC-2.0 |
| | more than 25 m | DPYC-3.5 |

Note: For remote control of the DC-AC inverter, install a remote switch near the display unit and use cable type DPYC-1.25 for the connection between the remote switch and the DC-AC inverter.

- DPYC-xx is the Japan Industrial Standard (JIS) cable. The conductor composition of these cables is as follows. If necessary, use equivalent cables.

Table 3-1 Conductor Composition

| Cable Type | Nominal cross sectional area | Number of wires | Diameter of wire |
|----------------|------------------------------|-----------------|------------------|
| 660V-DPYC-8 | 8 m ² | 7 | 1.2 mm |
| 250V-DPYC-3.5 | 3.5 m ² | 7 | 0.8 mm |
| 250V-DPYC-2.0 | 2.0 m ² | 7 | 0.6 mm |
| 250V-DPYC-1.25 | 1.25 mm ² | 7 | 0.45 mm |

1) Fabrication of cable

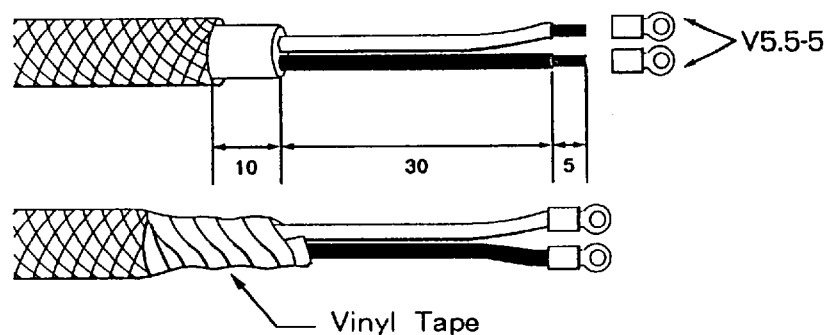


Fig. 3-21

2) Connection

TR-2450

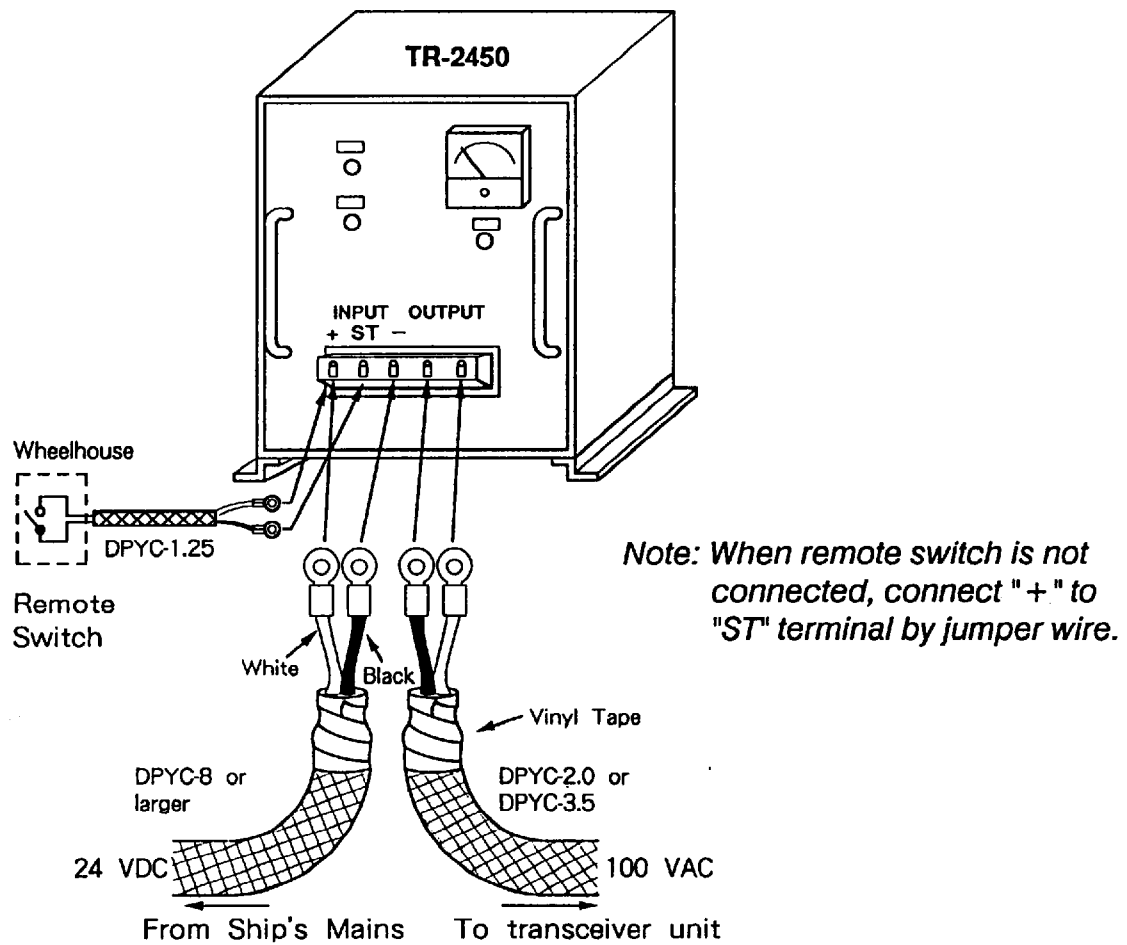
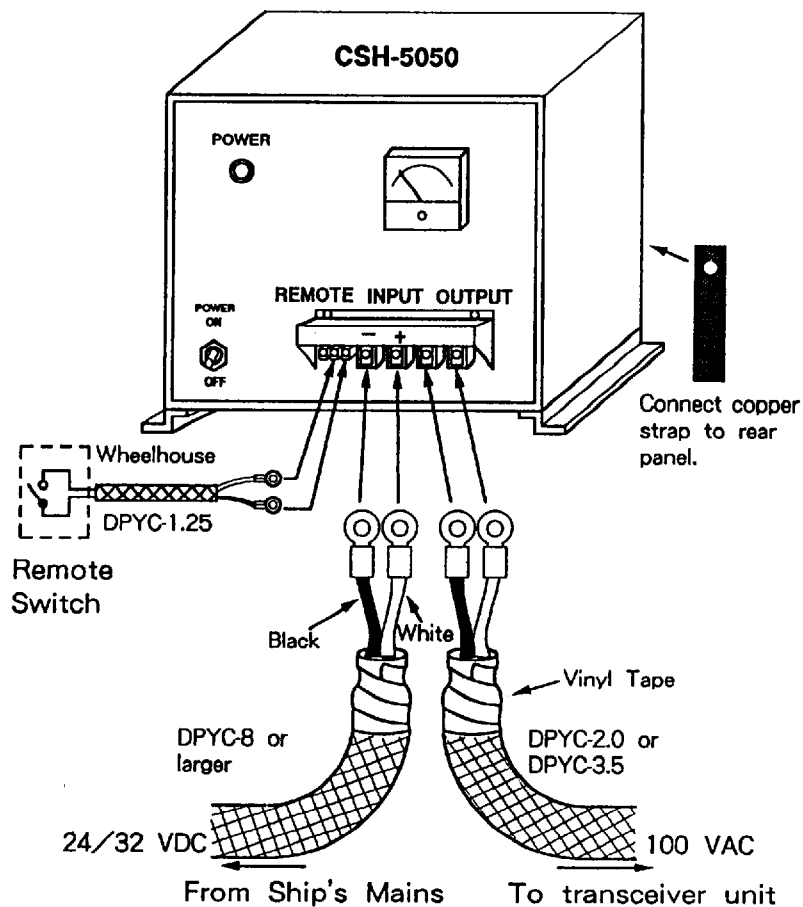


Fig. 3-22



- Note**
1. The remote terminals are connected parallel to the POWER switch of the unit. To turn the unit on/off by a remote switch, set the POWER switch to OFF.
 2. The unit is set at the factory for operation from 24 VDC mains. For 32 VDC, change transformer tap connection and adjust potentiometer setting for required output voltage. For further information, see the installation instructions attached to the unit.

Fig. 3-23

CHAPTER 4 POST-INSTALLATION CHECK AND ADJUSTMENT

4.1 Line Voltage

1) Transceiver Unit

1. Turn the power switch on. Confirm that the POWER lamp lights and there is input voltage at the service outlet. Also confirm that 100 VAC is present between terminals #10 and #11 of TB5.

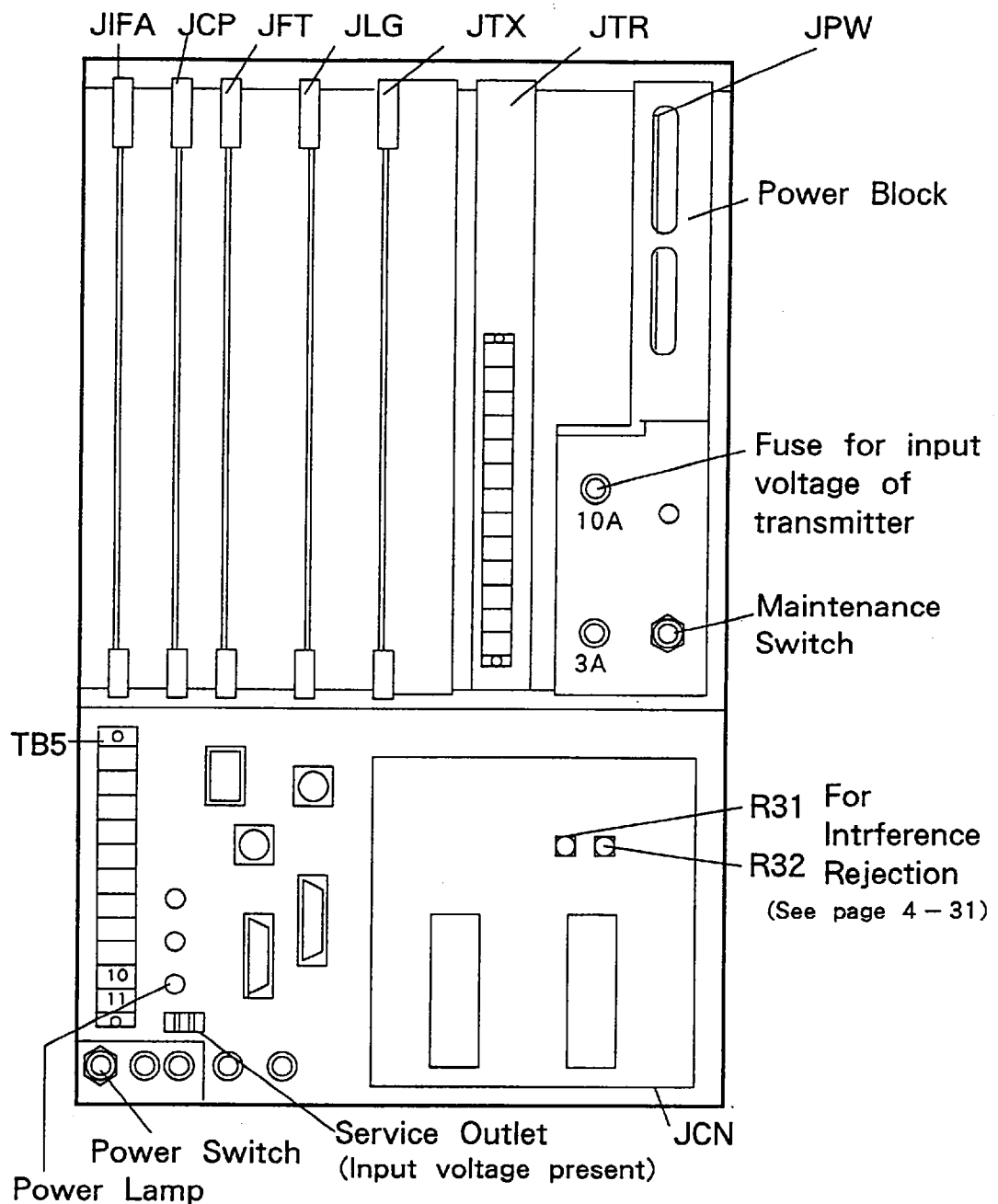


Fig. 4-1 Transceiver Unit, Inside view

- Turn the power switch of the display unit on. Confirm that the power lamp (green) on the transceiver unit (see below) lights. Make sure the maintenance switch is off; then confirm the voltage at the following points.

| PCB | Check Point | Rating | Adjustment Point |
|----------------|--------------------|----------------|------------------|
| JPW 66P3220 | CR8 | Light (- 12V) | - |
| | TP1 (+) TP9 (-) | - 12.2V ± 0.1V | - |
| | TP2 (+) TP9 (-) | 2.5V ± 15% | R10 |

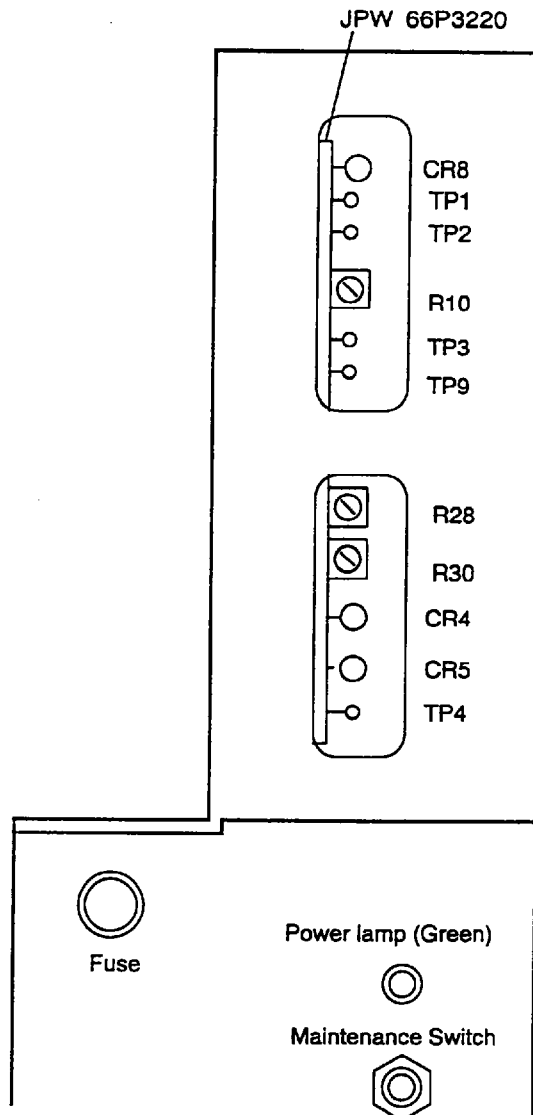


Fig. 4-2

2) Display Unit

1. Turn on the power switch of the transceiver unit. Confirm that CR2 (green LED) on the IRE board 66P3202 lights.

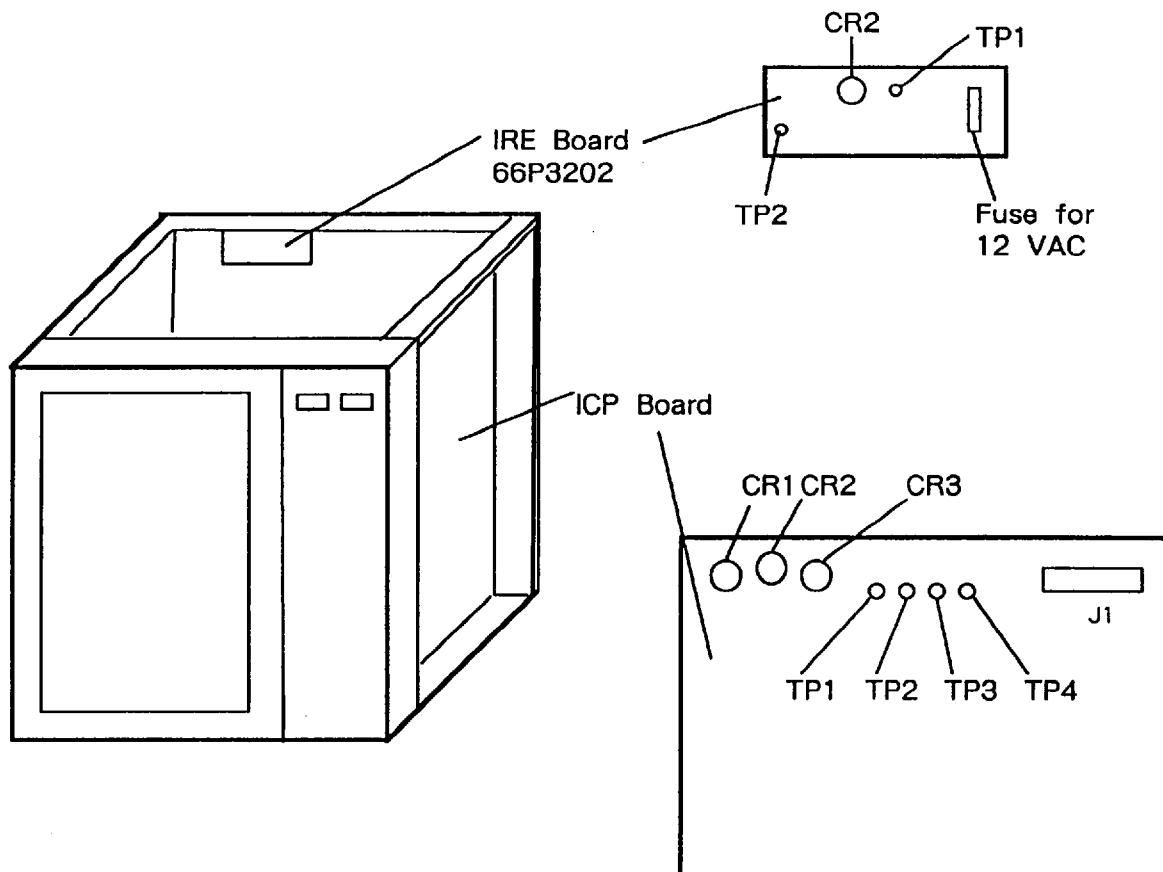


Fig. 4-3 Check Lamps inside the Display Unit

2. Press the power switch on the front panel of the display unit. Confirm that the cooling fan rotates and CR1 (+5V), CR2 (+12V) and CR3 (-12) LEDs light.

Check point for the line
voltages on ICP board

| | |
|------|-------|
| TP1: | 0V |
| TP2: | + 5V |
| TP3: | + 12V |
| TP4: | - 12V |

4.2 LED Status Check

Note: Some LEDs have been deleted.

1) Transceiver Unit

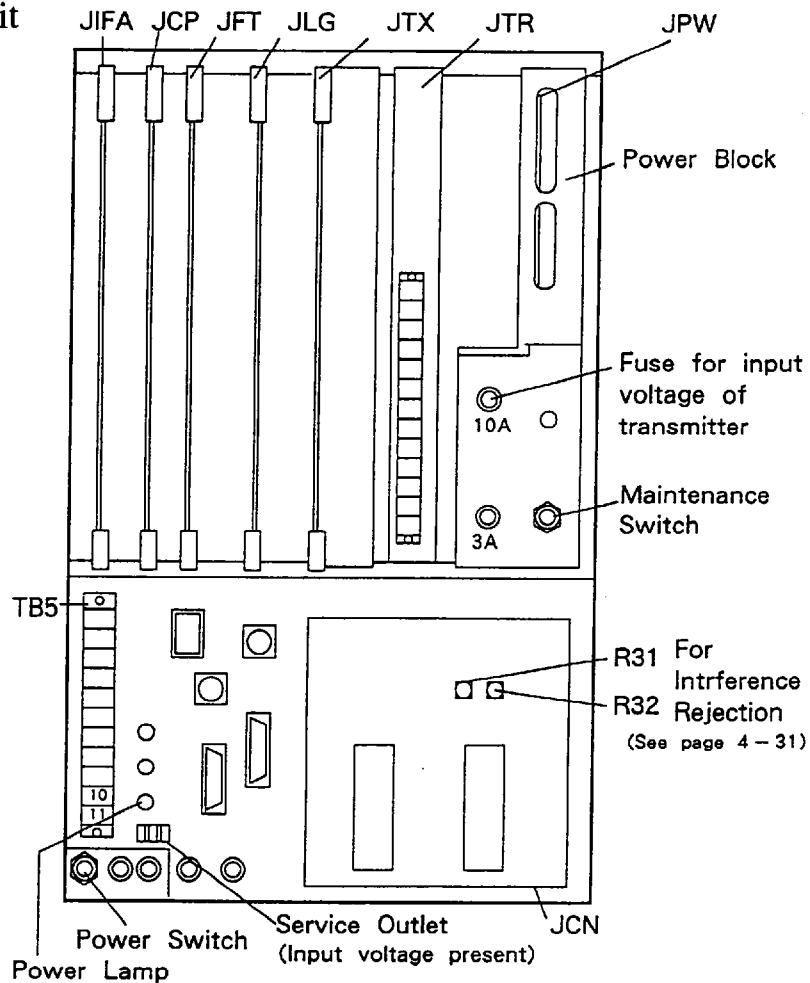


Fig.4-4 Location of Parts inside the Transceiver Unit.

a. JCN Board 66P3221

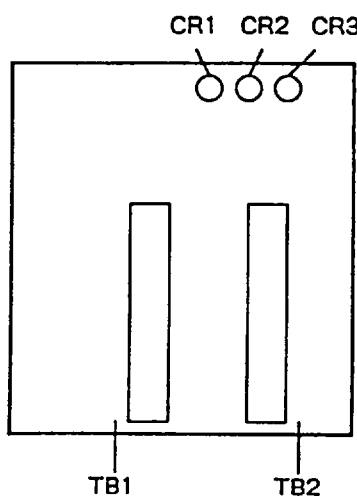


Fig. 4-5 JCN Board

| LED | | Status | Remarks |
|-----|---------|--------|---|
| No. | Signal | | |
| CR1 | LOG 200 | ◐ | Blinks with ship's speed. |
| CR2 | AUT-P | ● | Normally OFF. Lights when ship's speed alarm sounds. After turning on the power, it lights until log pulse is output. |
| CR3 | LOG IN | ◐ | Normally OFF. Blinks when external log signal is input. |

Color of LED: orange

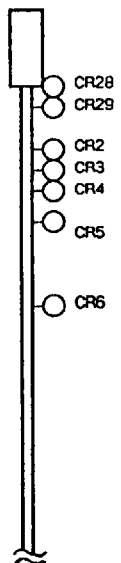
- : Lit
- ◐ : Blinking
- : Off

b. JIFA Board 66P3800

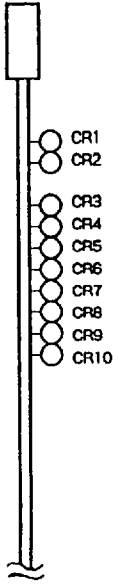
| LED Location | LED | | Status | Remarks |
|--------------|------|--------|---------|---|
| | No. | Signal | | |
| | CR1 | PASS | ○ (GRN) | Lights when self-check of this board is OK. |
| | CR2 | HALT | ◐ | Blinks with Halt command of CPU. |
| | CR3 | DT1 | ○ | Not used. |
| | CR4 | TX1 | ◐ | For factory check (Blinks once in every three seconds.) |
| | CR5 | RX1 | ● | For factory check (Normally off). |
| | CR6 | DS1 | ● | Not used. |
| | CR7 | TXS | ◐ | Blinks or lights with transmission of echo data. |
| | CR8 | CKS | ◐ | Blinks every 15 sec. with transmission of echo data clock. |
| | CR9 | AUTX | ◐ | Blinks with output data from AUX port. |
| | CR10 | AUTR | ◐ | Blinks with input data to AUX port. |
| | CR11 | CIFT | ◐ | Blinks with output data from CIF port. (3 second interval) |
| | CR12 | CIFR | ◐ | Blinks with input data to CIF port. |
| | CR13 | NMET | ◐ | Blinks with output data from NMEA port. (3 second interval) |
| | CR14 | NMER | ● | Blinks with input data to NMEA port. |
| | CR15 | GYRC | ◐ | Blinks with clock input from AD-10S. |
| | CR16 | GYRD | ◐ (GRN) | Blinks with gyro data input from AD-Converter. (looks lit) |
| | CR17 | RELC | ◐ | Blinks with clock output of true bearing. |
| | CR18 | RELD | ◐ (GRN) | Blinks with data output of true bearing. (CR17 and CR18 synchronizes) |
| | CR19 | LOG2 | ◐ | Blinks with output of 200p/nm signal. (Synchronized with relay chatter) |
| | CR20 | LOG1 | ◐ | Blinks with external log pulse input. |
| | CR21 | EXP1 | (◐) | Blinks with external KP signal 1 input. |
| | CR22 | EXP2 | (◐) | Blinks with external KP signal 2 input. |
| | CR23 | DPCS | ◐ | Blinks with internal signal. |

Color of LED is orange unless noted otherwise.

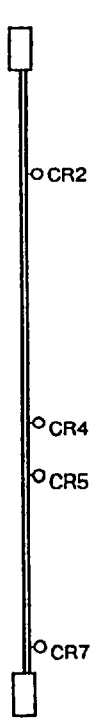
c. JCP Board 66P3205

| LED Location | LED | | Status | Remarks |
|---|------|------------|---------|--|
| | No. | Signal | | |
|  | CR28 | TXD | ● | Blinks irregularly with data output to display unit. |
| | CR29 | RXD | ● | Blinks irregularly with data input from display unit. |
| | CR2 | KP | ● | Blinks with transmission KP output. |
| | CR3 | ADKP (EST) | ● | Blinks with echo level data transmission to display unit. (Lights once in every 15 sec.) |
| | CR4 | EG | ● | Blinks with echo gate. Synchronizes with KP. |
| | CR5 | EXKP1 | ● | Blinks with external KP input. |
| | CR6 | PASS1 | ○ (GRN) | Lights when self-check of this board is OK. |

d. JFT board

| LED Location | LED | | Status | Remarks |
|---|------|--------|---------|--|
| | No. | Signal | | |
|  | CR1 | RUN | ● | Blinks irregularly at normal operation. |
| | CR2 | PASS | ○ (GRN) | Lights when self-check of this board is OK. |
| | CR3 | TASK1 | ● | Some of these LEDs blink when the equipment is working normally. |
| | CR4 | TASK2 | ● | |
| | CR5 | TASK3 | ● | |
| | CR6 | TASK4 | ● | |
| | CR7 | TASK5 | ● | |
| | CR8 | TASK6 | ● | |
| | CR9 | TASK7 | ● | |
| | CR10 | TASK8 | ● | |

e. JTX Board 66P3209

| LED Location | LED | | Status | Remarks |
|--|-----|--------|--------|---|
| | No. | Signal | | |
|  | CR2 | BEAM1 | | Blinks with transmission. Lights when transmitter high voltage is applied. Blinks with transmission. CR2, CR4 and CR7 synchronizes with KP (CR2 of JCP board). |
| | CR4 | BEAM2 | | |
| | CR5 | +B | | |
| | CR7 | BEAM3 | | |

2) Display Unit

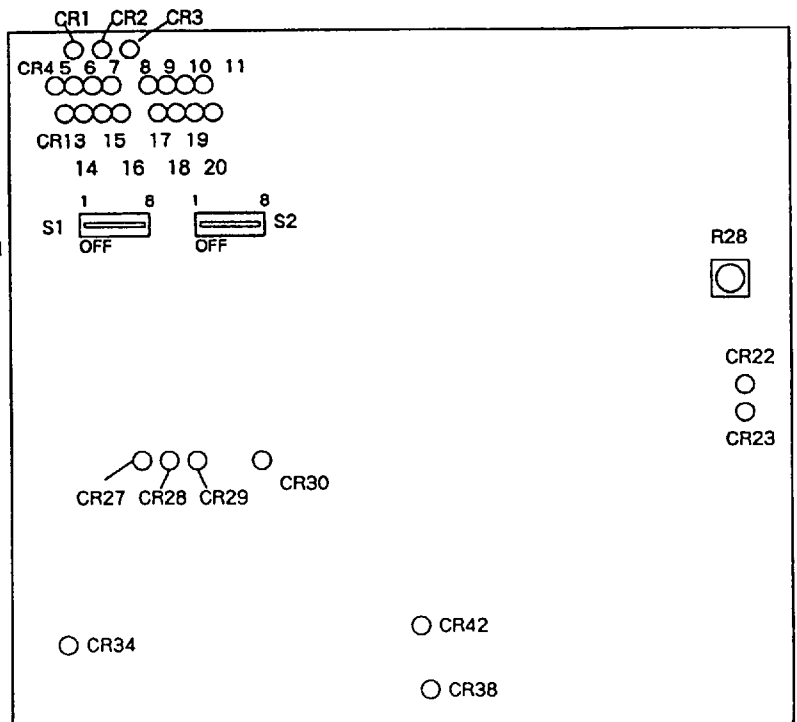
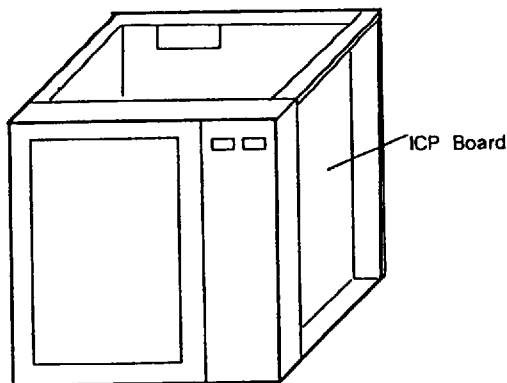


Fig. 4-6

| LED | | Status | Remarks |
|------|--------|---------|--|
| No. | Signal | | |
| CR1 | +5V | ○ (GRN) | Lights when line voltages are normal. |
| CR2 | +12V | ○ (GRN) | |
| CR3 | -12V | ○ (GRN) | |
| CR4 | D0 | ● | Blinks randomly. (Task status of CPU is displayed.) |
| CR5 | D2 | ● | |
| CR6 | D4 | ● | |
| CR7 | D6 | ● | |
| CR8 | D8 | ● | |
| CR9 | D10 | ● | |
| CR10 | D12 | ● | |
| CR11 | D14 | ● | |
| CR13 | D1 | ● | |
| CR14 | D3 | ● | |
| CR15 | D5 | ● | |
| CR16 | D7 | ● | |
| CR17 | D9 | ● | |
| CR18 | D11 | ● | |
| CR19 | D13 | ● | |
| CR20 | D15 | ● | |
| CR22 | TXD | ● | Blinks irregularly with data output to transceiver unit. |
| CR23 | RXD | ● | Blinks irregularly with data input from transceiver unit. |
| CR27 | EDA | ● | Blinks with receive echo data from transceiver unit. |
| CR28 | ECK | ● | Blinks with clock of receive echo data from transceiver unit. |
| CR29 | EST | ● | Blinks with echo start signal. (CR27, 28 and 29: once every 15 seconds) |
| CR30 | INT | ● | Blinks with interrupt signal to CPU. |
| CR34 | STD.P | ● | Blinks with 1 second clock of internal timer. |
| CR38 | RESET | ● (RED) | Normally OFF. Just after the power is turned on or off, it lights momentarily (lights with reset signal of CPU). |
| CR42 | HALT | ● | Blinks with halt command of CPU. (Looks OFF) |

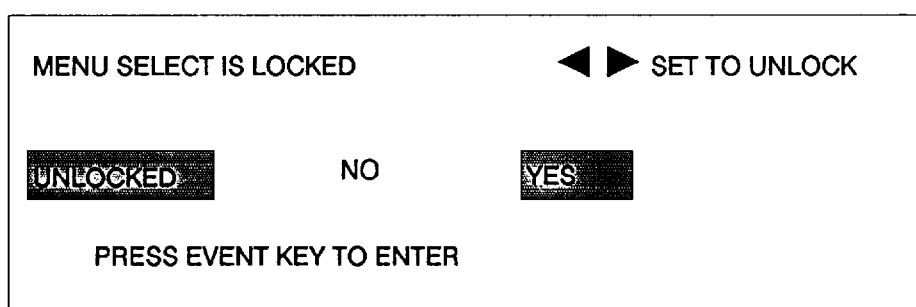
4.3 Menu 2 Screen

The CI-60/G has a menu, comprised of menus 1, 2, 3 and 4, for presetting less often used functions. (Menu 4 is available only on CI-60G). To display the menu, press the [MENU] key.

The [◆] and [◀▶] knobs serve to select a menu. Items which appear in red are "locked" to prevent accidental alteration of their setting. To unlock an item, follow the procedure below.

Unlock procedure



1. Press the [MENU] key.
2. Select MENU MODE by the [◆] knob.
3. Select MENU 2 by the [◀▶] knob.
4. Select MENU SELECT by the [◆] knob.



5. Rotate the [◀▶] knob clockwise more than 2 clicks. The displays shows the following:
6. Press the [EVENT] key.
7. Rotate the [◀▶] knob clockwise. YES appears in reverse video and the "red" letters change to green, meaning all items are unlocked.

NOTE: After confirming all items mentioned in this chapter, select "NO" on the above screen.

4.3.1 Self-check

1. Press the [MENU] key.
2. Select MENU MODE by the [] knob.
3. Select MENU 2 by the [] knob. The display shows the following:





| * MENU 2 * |  KNOB: ITEM | |  KNOB: SETUP | |
|-------------|--|--------|---|-------|
| Oct/15/1991 | | | END: MENU KEY | |
| MENU MODE | : MENU1 | MENU2 | MENU3 | MENU4 |
| REF DEPTH | : OFF | E/S | | |
| BEAM TEST | : OFF | | | |
| SELF CHECK | : SINGLE | CONTI | PANEL | ECHO |
| DEMO DATA | : OFF | DP3.4 | LOG10 | |
| TRIP RESET | : RESET | (0.00) | | |
| DATE/TIME | : TIME | DATE | | |
| MENU SELECT | : LOCK | UNLOCK | | |
| MENU SET | : FACTORY | | | |

Fig. 4-7 Menu 2 Screen

4. Select SELF CHECK by the [] knob. SINGLE appears in reverse video.
5. Select SINGLE, CONTI, PANEL or ECHO by the [] knobs.

SINGLE: Initiates the system check for one cycle.

CONTI: Initiates the system check repeatedly. To escape, press the [MENU] key.

PANEL: Checks the keys and controls on the front panel for proper operation.

ECHO: Displays echograms of three beams. By observing echograms, fault of transmitter/receiver/transducer can be found. Also external noise or interference can be observed.

6. Press the [EVENT] key to execute the self-check.

1) Self check: SINGLE

The display should look something like Fig. 4-8.

| ERR NO. | SYSTEM | CHECK | END:MENU | KEY |
|------------------|---------|-----------------------|-----------|------|
| -----CI-600----- | | | | |
| | IP VOL. | 6650030206 | | ...a |
| | IP TBL. | 6650037105 | | ...b |
| | IP MEM. | 1 2 3 4 5 6 7 | OK | ...c |
| | IP MEM. | 8 9 10 11 | OK | ...d |
| | IP DSW. | " 10 01" | BATT OK | ...e |
| -----CI-610----- | | | | |
| | CP VOL. | 6650045203 | | ...f |
| | CP TBL. | 6656654103 | | ...g |
| | CP MEM. | 1 2 3 4 5 6 7 8 | OK | ...h |
| | CP DSW. | " 00 00 00 00" | | ...i |
| | FT VOL. | 6650055100 | | ...j |
| | FT MEM. | 1 2 3 4 5 6 7 | OK | ...k |
| | TX DEV. | 1 | OK | ...l |
| | IF VOL. | 6650040103 | | ...m |
| | IF MEM. | 1 2 3 | OK | ...n |
| | IF DSW. | " 00 00 00" | | ...o |
| | IF DEV. | 1 | OK | ...p |
| | IF AN1. | RU3. 00V RL2. 00 | OK | ...q |
| | IF AN2. | MLD | 2. 00V OK | ...r |
| | IF AN3. | PWR | 2. 50V OK | ...s |
| | IF AN4. | PTH --- V RLL --- V | | ...t |
| | IF AN5. | IS1 1. 01V IS2 1. 01V | | ...u |

Fig. 4-8 System Check Screen

Items (a) to (e) : Display Unit Self check

- (a) , (b) : PROM program number of ICP board (Last two digits are subject to change with program update.)
- (c) , (d) : Memory IC check of ICP board. If normal, "OK" appears. If defective an asterisk appears next to the offending memory number along with the message NG (No Good).
 - 1 to 4 : RAM check (Working)
 - 5 : PROM check (Program)
 - 6 : PROM check (Data)
 - 7 : ROM check (Backup)
 - 8 to 11: RAM check (Video)

- ⓔ : Hexadecimal display of DIP switch settings on ICP board and backup battery status. If the battery voltage is more than $2.6\text{ V} \pm 0.1\text{ V}$, "OK" appears. When "NG" appears, replace the battery as soon as possible.

Items ⓕ to Ⓤ : System Check of the Transceiver Unit

- ⓕ , ⓖ : PROM program number of JCP board. (Last two digits are subject to change with program updates.)
- ⓗ : Memory IC check of JCP board. If normal, "OK" appears. If defective, an asterisk appears next to the offending memory number along with the message NG (No Good).
1 to 5 : RAM check
6 : PROM check
7, 8 : EEROM check
- ⓙ : Hexadecimal display of DIP switch settings on JCP board.
- ⓓ : PROM program number of JFT board. (Last two digits are subject to change with program updates.)
- ⓖ : Memory IC check of JFT board
1 : PROM check
2 - 7 : RAM check
- ⓓ : Transmitter device check
- ⓓ : PROM program number of JIF board. (Last two digits are subject to change with program updates.)
- ⓓ : Memory IC check of JIF board
1 : PROM check
2 - 3 : RAM check
- ⓓ : Hexadecimal display of DIP switch settings on JIF board
- ⓓ : Device check of JIF board
- ⓓ : Analog signal (A-D converter reference voltage) check of JIF board
- ⓓ : Analog signal (temperature sensor) check of JIF board
- ⓓ : Analog signal (ship's mains) check of JIF board
- ⓓ : Analog signal (inclinometer, if connected) check
- ⓓ : Analog signal check ($1.0 \pm 0.5\text{V}$ is normal, factory use)

"ERR No." indication

If the unit detects abnormal operation of the transceiver unit it displays an (blinking) error message and a three-digit error code and releases the audible alarm. (Error indication does not interrupt the operation of the equipment.)

The table below shows the error codes and their meanings. If there are multiple errors, the youngest error code is displayed.

| ERROR CODE | ERROR STATUS (CHECK ITEM) |
|------------|--|
| 000 | Abnormal mains input voltage |
| 001 | Transducer overheated |
| 002 | Abnormal TX high voltage (+ B) |
| 003 | Abnormal TX voltage for beam1 |
| 004 | Abnormal TX voltage for beam2 |
| 005 | Abnormal TX voltage for beam3 |
| 006 | Abnormal TX current for beam1 |
| 007 | Abnormal TX current for beam2 |
| 008 | Abnormal TX current for beam3 |
| 100 | External position data missing despite WT SPEED = NAV-TIDE and NAV DAT = L/L in menu 4. (*1) |
| 101 | External speed data missing despite WT SPEED = NAV-TIDE and NAV DAT = SPD in menu 4. (*1) |
| 102 | External time data missing despite TIME DATA = EXT in menu 4. (*1) |
| 103 | External depth data missing despite REF DEPTH = E/S in menu 2. |
| 104 | External heading data missing |
| 105 | External bearing (course) data differs from internal absolute bearing by more than 5°. |
| 106 | External water temperature data missing despite TEMP DSP = ON in menu 1. |
| 200 | External keying pulse irregular |
| 201 | Abnormal temperature sensor input |
| 202 | Abnormal "roll" signal from inclinometer |
| 203 | Abnormal "pitch" signal from inclinometer |

*1: Displayed only on CI-60G when the corresponding data is missing.

The system check takes about 50 seconds to complete, after which control is returned to the menu 2 screen.

4) Self Check : ECHO

The echo test displays echograms from the three transducers, allowing you to check the transmitter, receiver and transducer for proper operation. The display looks something like Fig. 4-10.

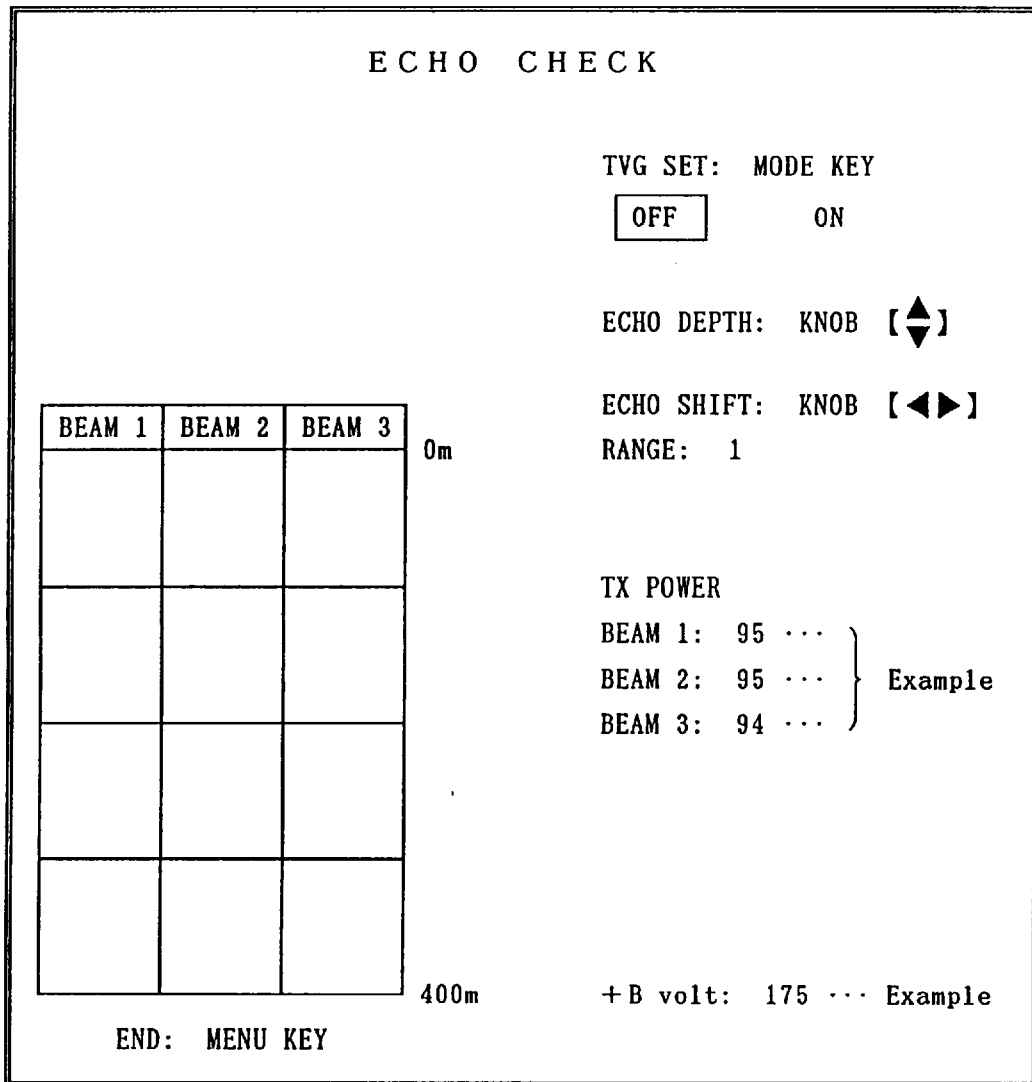


Fig. 4-10 Echo Check Screen

1. TVG SET: Press the [TRACK MODE] key to turn TVG SET, ON and OFF alternately.
 ON : Displays received echo compensated by TVG signal.
 OFF : Displays received echo without TVG compensation.
2. The [▲▼] knob selects a depth range (50, 100, 150, 250, 300, 350 or 400 m) of echogram.
3. The [◀▶] knob selects coloring threshold levels for echogram (1 to 36).

4. TX POWER shows transmission levels of each beam. A value of more than 90 is normal. +B voltage shows high voltage of transmission circuit. The normal value is 175 ±25. (Refer to page 4-22.)

5. To terminate the echo check, press the [MENU] key.

4.3.2 Demo Data

- 1) DP3.4 : Generates test signals of 3.4 knots (ship speed and tide speed) at the transceiver unit and sends them to the display unit and the log pulse output terminal (200p/nm). On the display, you will read "3.4 kt" as ship's speed and tide speeds of three layers.
- 2) LOG 10 : Generates test signal of 10 knots (ship speed) at the transceiver unit and send it to the display unit and the log pulse output terminal (200p/nm). On the display, you will read "10.0 kt" as ship's speed. equipments.

DEMO DATA OUTPUTTING appears on the display during this check.

4.3.3. Beam Test

If the echo level of a beam in the echogram presentation is lower than the others, the beam may be defective. The equipment can still be used temporarily by using the remaining beams, although the measuring accuracy is reduced and movement in port-starboard direction can not be detected depending on the defective beam number. Refer to the table below.

In the beam test, the [◀▶] knob serves to select a beam test; OFF, F1, F12, F13 and F23. BEAM TESTING appears on the display during the beam test.

| Beam Test | Operating Beam No. | Direction | Accuracy | Defective Beam No. |
|-----------|--------------------|---------------|----------|--------------------|
| OFF | 1, 2, 3 | All | High | None |
| F1 | 1 | Fore-aft only | * | 2, 3 |
| F12 | 1, 2 | All | * | 3 |
| F13 | 1, 3 | All | * | 2 |
| F23 | 2, 3 | All | * | 1 |

* The accuracy is substantially less than that of "OFF" position, but is still usable.

4.4 DIP Switch Setting

1) Transceiver Unit

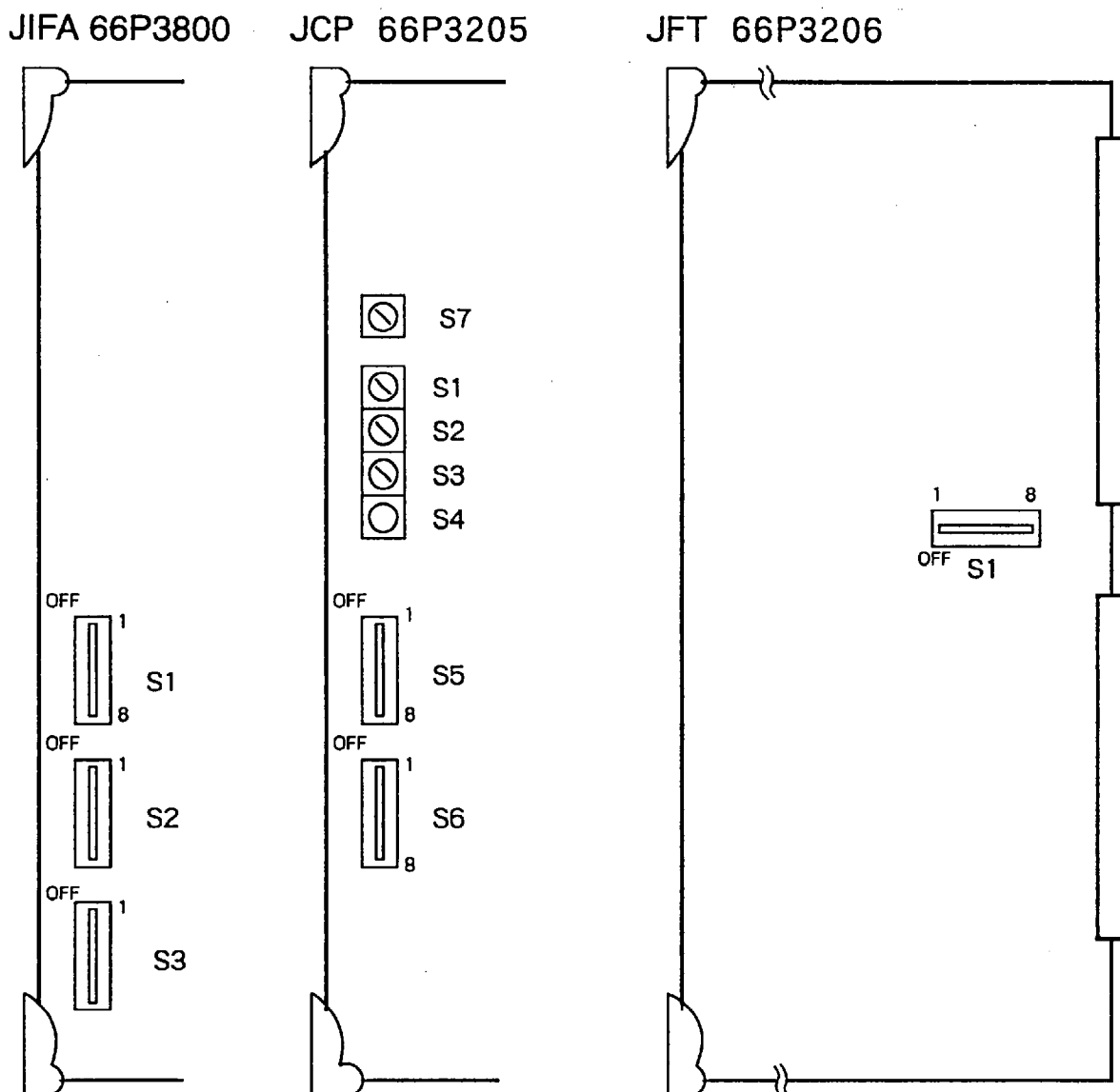


Fig. 4-11 Location of DIP Switches

DIP switches settings on each board

| PCB | Symbol No. | Factory Setting | | | Functions | | | | | | | | | | | | | | | |
|-----------------|------------|-----------------|--|--|--|-----|-----|----|-----|----|---|-----|-----|----|----|--------|-----------|------|------|------|
| | | No. | ON | OFF | | | | | | | | | | | | | | | | |
| JIFA 66P3800 | S1 | 1 | | O | NMEA OFF: Ver 2.0 (With check sum at last output data ON: Ver. 1.5 (Without check sum) | | | | | | | | | | | | | | | |
| | | 2 | | O | No use | | | | | | | | | | | | | | | |
| | | 3 | | O | Log pulse out OFF: Forward only ON: Forward and backward | | | | | | | | | | | | | | | |
| | | 4 | | O | No use | | | | | | | | | | | | | | | |
| | | 5 | | O | Receive data format for AUX port (Effective when S2-1/2 are set to ON.) | | | | | | | | | | | | | | | |
| | | 6 | | O | <table border="1"> <tr> <td>5</td> <td>OFF</td> <td>ON</td> <td>OFF</td> <td>ON</td> </tr> <tr> <td>6</td> <td>OFF</td> <td>OFF</td> <td>ON</td> <td>ON</td> </tr> <tr> <td>Data</td> <td>undefined</td> <td>DAT3</td> <td>DAT2</td> <td>DAT1</td> </tr> </table> DAT1: TKC (<CR>DDDdd) DAT2:TKC (DDDd*<LF>) DAT3: Hokushin (\$HERHRC, DDDdd,+/-RRr*cs) | 5 | OFF | ON | OFF | ON | 6 | OFF | OFF | ON | ON | Data | undefined | DAT3 | DAT2 | DAT1 |
| | | 5 | OFF | ON | OFF | ON | | | | | | | | | | | | | | |
| | | 6 | OFF | OFF | ON | ON | | | | | | | | | | | | | | |
| | Data | undefined | DAT3 | DAT2 | DAT1 | | | | | | | | | | | | | | | |
| | 7 | | O | Depth data format OFF: CIF ON: NMEA | | | | | | | | | | | | | | | | |
| | 8 | | O | Temperature data format OFF: CIF ON: NMEA | | | | | | | | | | | | | | | | |
| | S2 | 1 | | O | Bearing data format | | | | | | | | | | | | | | | |
| | | 2 | | O | <table border="1"> <tr> <td>1</td> <td>OFF</td> <td>ON</td> <td>OFF</td> <td>ON</td> </tr> <tr> <td>2</td> <td>OFF</td> <td>OFF</td> <td>ON</td> <td>ON</td> </tr> <tr> <td>Sensor</td> <td>ADC</td> <td>CIF</td> <td>NMEA</td> <td>AUX</td> </tr> </table> ADC: AC converter (Furuno clocked-serial) | 1 | OFF | ON | OFF | ON | 2 | OFF | OFF | ON | ON | Sensor | ADC | CIF | NMEA | AUX |
| | | 1 | OFF | ON | OFF | ON | | | | | | | | | | | | | | |
| | | 2 | OFF | OFF | ON | ON | | | | | | | | | | | | | | |
| | | Sensor | ADC | CIF | NMEA | AUX | | | | | | | | | | | | | | |
| 3 | | | O | Log pulse measurement layer OFF: Reference layer ON: 1st layer | | | | | | | | | | | | | | | | |
| 4 | | O | | Set to ON when S1 #3 is off. | | | | | | | | | | | | | | | | |
| 5 | | | O | Bearing output at slow speed (less than 0.5 kts) OFF: True bearing ON: Heading | | | | | | | | | | | | | | | | |
| 6 | | O | Bearing output data OFF: True bearing On: Heading | | | | | | | | | | | | | | | | | |
| 7 | | O | Signal level of AUX port OFF: Current loop ON: RS-232C | | | | | | | | | | | | | | | | | |
| 8 | | O | CIF data ON/OFF OFF: Standard ON: Option | | | | | | | | | | | | | | | | | |

| PCB | Symbol No. | Factory Setting | | | Functions | | | | | | | | | | | | | | | |
|-----------------|------------|-----------------------|---|-----------------------|---|-----|-----|----|-----|----|---|-----|-----|----|----|------|--------|--------|--------|-----|
| | | No. | ON | OFF | | | | | | | | | | | | | | | | |
| JIFA 66P3800 | S3 | 1 | | <input type="radio"/> | CIF data output OFF: Data created by CI-60/G only ON: CI-60/G data combined with incoming CIF data (through-line) | | | | | | | | | | | | | | | |
| | | 2 | | <input type="radio"/> | Analog indicator OFF: for 30 kt range scale indicator ON: For 40 kt range scale indicator | | | | | | | | | | | | | | | |
| | | 3 | | <input type="radio"/> | Interference rejection by KP1 OFF: OFF ON: ON | | | | | | | | | | | | | | | |
| | | 4 | | <input type="radio"/> | Interference rejection by KP2 OFF: OFF ON: ON | | | | | | | | | | | | | | | |
| | | 5 | | <input type="radio"/> | Synchronous transmission with KP1 input (available with #3 ON) OFF: OFF ON: ON | | | | | | | | | | | | | | | |
| | | 6 | | <input type="radio"/> | Inclinometer ON/OFF OFF: OFF ON: ON | | | | | | | | | | | | | | | |
| | | 7 | | <input type="radio"/> | Bearing sensor OFF: Yes ON: No (always HU) | | | | | | | | | | | | | | | |
| | | 8 | | <input type="radio"/> | NMEA port ON/OFF OFF: OFF ON: NMEA 0183 ON | | | | | | | | | | | | | | | |
| JCP 66P3205 | S5 | 1 | | <input type="radio"/> | Selection of bottom tracking reference beam | | | | | | | | | | | | | | | |
| | | 2 | | <input type="radio"/> | <table border="1"> <tr> <td>1</td> <td>OFF</td> <td>ON</td> <td>OFF</td> <td>ON</td> </tr> <tr> <td>2</td> <td>OFF</td> <td>OFF</td> <td>ON</td> <td>ON</td> </tr> <tr> <td>Beam</td> <td>Beam 1</td> <td>Beam 2</td> <td>Beam 3</td> <td>All</td> </tr> </table> | 1 | OFF | ON | OFF | ON | 2 | OFF | OFF | ON | ON | Beam | Beam 1 | Beam 2 | Beam 3 | All |
| | | 1 | OFF | ON | OFF | ON | | | | | | | | | | | | | | |
| | | 2 | OFF | OFF | ON | ON | | | | | | | | | | | | | | |
| | | Beam | Beam 1 | Beam 2 | Beam 3 | All | | | | | | | | | | | | | | |
| | | 3 | | <input type="radio"/> | Transmission output OFF: Level 2 (normal) ON: Level 1 (reduced) | | | | | | | | | | | | | | | |
| | | 4 | | <input type="radio"/> | TX repetition rate & pulse width in water tracking mode OFF: Fast rate/narrow pulse (Standard) ON: Slow rate/wide pulse (Deep) | | | | | | | | | | | | | | | |
| | | 5 | | <input type="radio"/> | Automatic compensation of sound velocity by thermal sensor OFF: Yes ON: No | | | | | | | | | | | | | | | |
| 6 | | <input type="radio"/> | Smoothing response for current indication OFF: Slow (standard) ON: Fast (less stable) | | | | | | | | | | | | | | | | | |
| 7 | | <input type="radio"/> | Smoothing response for current indication in nav-aided mode (*Effective on CI-60G only) OFF: Fast (standard) ON: Slow (high stability) | | | | | | | | | | | | | | | | | |
| 8 | | <input type="radio"/> | Validity of GPS data when ship's speed is almost 0 kt. OFF: Valid ON: Invalid (reject) | | | | | | | | | | | | | | | | | |

| PCB | Symbol No. | Factory Setting | | | Functions |
|----------------|------------------|-----------------|-----------------------|-----------------------|--|
| | | No. | ON | OFF | |
| JCP 66P3205 | S6 | 1 | <input type="radio"/> | <input type="radio"/> | Menu 4 screen presentation OFF: No (CI-60) ON: Yes (CI-60G) |
| | | 2 | | <input type="radio"/> | |
| | | 3 | | <input type="radio"/> | |
| | | 4 | | <input type="radio"/> | |
| | | 5 | | <input type="radio"/> | |
| | | 6 | | <input type="radio"/> | |
| | | 7 | | <input type="radio"/> | |
| | | 8 | | <input type="radio"/> | |
| | S7 Rotary Switch | 0 | | | Echo level selection (to monitor at TP8) 0: TVG compensated signal of beam 1 1: Raw signal of beam 1 (without TVG) 2: TVG compensated signal of beam 2 3: Raw signal of beam 2 (without TVG) 4: TVG compensated signal of beam 3 5: Raw signal of beam 3 (without TVG) |
| | S1 | 0 | | | TVG curve selection 0: For water temperature 12 °C 1: For water temperature 26 °C |
| | S2 | 0 | | | Normally 0 (Keep these switches at "0" positions.) |
| | S3 | 0 | | | |
| S4 | 0 | | | | |
| | | | | | |
| JFT 66P3206 | S1 | 1 | | <input type="radio"/> | Factory use (All switches should be kept OFF for normal operation.) |
| | | 2 | | <input type="radio"/> | |
| | | 3 | | <input type="radio"/> | |
| | | 4 | | <input type="radio"/> | |
| | | 5 | | <input type="radio"/> | |
| | | 6 | | <input type="radio"/> | |
| | | 7 | | <input type="radio"/> | |
| | | 8 | | <input type="radio"/> | |

2) Display Unit

ICP board 66P3200 (Right side of the display unit)

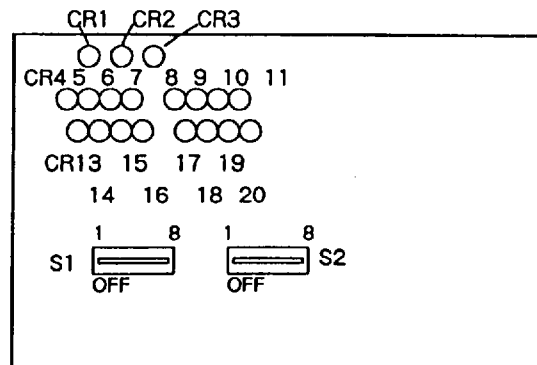


Fig. 4-12

| PCB | Symbol No. | Factory Setting | | | Functions |
|----------------|------------|-----------------|-----------------------|-----------------------|--|
| | | No. | ON | OFF | |
| ICP 66P3200 | S1 | 1 | | <input type="radio"/> | Bearing indication method OFF: 32-point notation in large characters ON: Degree notation in large characters |
| | | 2 | | <input type="radio"/> | Unit of distance/range OFF: nm ON: km |
| | | 3 | | <input type="radio"/> | Current vector pointing direction OFF: Direction flowing to ON: Direction flowing from |
| | | 4 | | <input type="radio"/> | Manual heading input OFF: Disable ON: Enable |
| | | 5 | <input type="radio"/> | | Display language (See S2 descriptions below.) OFF: Japanese ON: Other than Japanese |
| | | 6 | | <input type="radio"/> | Panel check OFF: Normal operation ON: Test |
| | | 7 | | <input type="radio"/> | Black/white gradation test OFF: Normal operation ON: Test |
| | | 8 | | <input type="radio"/> | Color gradation test OFF: Normal operation ON: Test |
| | S2 | 1 | <input type="radio"/> | | English display (OFF: No ON: Yes) |
| | | 2 | | <input type="radio"/> | Norwegian display (OFF: No ON: Yes) |
| | | 3 | | <input type="radio"/> | Spanish display (OFF: No ON: Yes) |
| | | 4 | | <input type="radio"/> | French display (OFF: No ON: Yes) |
| | | 5 | | <input type="radio"/> | Reserved for future expansion |
| | | 6 | | <input type="radio"/> | |
| | | 7 | | <input type="radio"/> | |
| | | 8 | | <input type="radio"/> | |

4.5 TX Output Check

To check the TX output waveforms, turn DIP switch S5-#4 on JCP board 66P3205 (See page 4-19) to ON and set the [TRACK MODE] key on the front panel to "water tracking mode".

Check Point of TX Output Waveforms

| | Check Point | |
|--------|-------------------------|-------------------------|
| | JTR Board TB3 | Junction Box |
| Beam 1 | Terminal 1 (H) 2 (C) | Terminal 1 (H) 2 (C) |
| Beam 2 | 4 (H) 5 (C) | 4 (H) 5 (C) |
| Beam 3 | 7 (H) 8 (C) | 7 (H) 8 (C) |

(If possible, check at the junction box.)

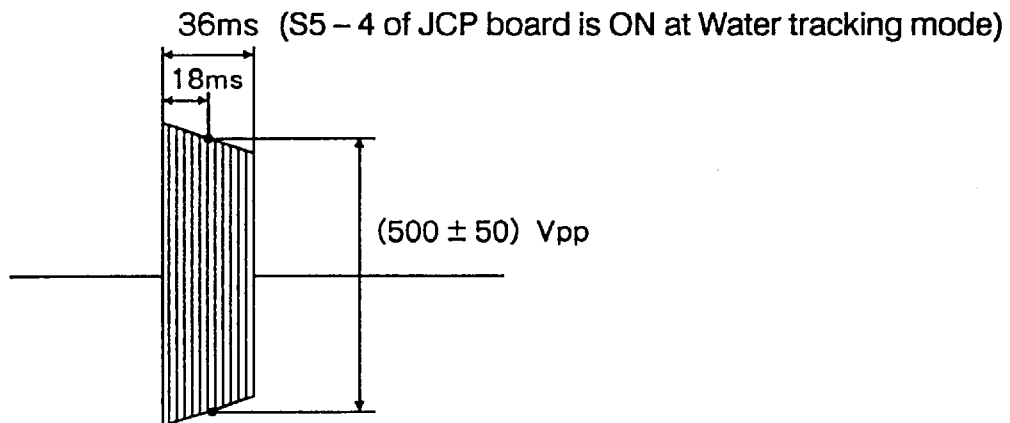


Fig. 4-13

Confirm that the +B voltage at the Echo Check Screen is 175 ± 25 . Refer to page 4-15. (This value is approximately 105 when DIP switch S5-#3 is ON (level 1). See page 4-19.)

4.6 Menu 3 Screen

The menu 3 provides items for calibrating the unit according to ship's construction, etc. If necessary, unlock the menu and enter appropriate data.

| * MENU 3 * | ◆ KNOB ITEM | ◀▶ KNOB SETUP |
|----------------|--------------------------|--------------------|
| Jun/15/1990 | | END: MENU KEY |
| MENU MODE : | MENU1 MENU2 | MENU3 MENU4 |
| SHIP SPD AVR : | 15sec | |
| DRAFT : | 0.0m | |
| WT SPD DEPTH : | 2.0m | |
| HEEL ANGLE : | 0.0° | |
| TRIM ANGLE : | 0.0° | |
| GT SPD CALIB : | 0.0% | |
| WT SPD CALIB : | 0.0% | |
| BEARNG CALIB : | 0.0° | |
| COURSE CALIB : | 0.0° (GT 0.0°)(NAV 0.0°) | |
| EXT KP1 DIST : | 0.0m | |
| EXT KP2 DIST : | 0.0m | |
| BTM TIDE TRK : | OFF ON | |

Fig. 4-14 Menu 3 Screen

1) DRAFT (0.0 to 25.6 m)

Set the depth of the transducer from the sea surface, by rotating the [◀▶] knob. This affects the depth setting of each layer.

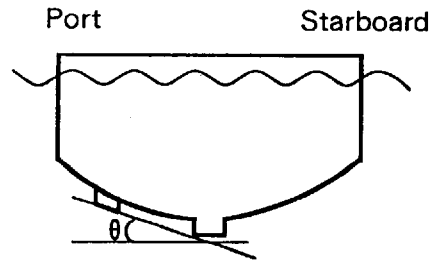
Depth setting on the panel = Draft setting at Menu 3 + distance from the transducer to the current measuring layer.

2) WT SPD DEPTH (2.0 to 25.6 m)

Set the depth of the reference layer, to measure ship's speed in the water tracking mode. Normally, adjustment of this value (2 m) is not necessary. When air bubbles at the surface affect the equipment and the ship's speed indication in the water tracking mode is unstable, however, change the setting a little deeper to get stable ship's speed.

3) HEEL ANGLE (-12.8 to +12.7°)

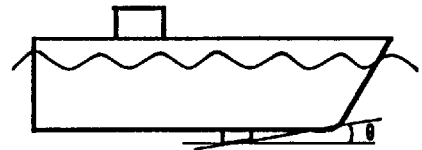
Compensates for lateral (port-starboard) inclination of the transducer face. Set "+" angle for port-high state and "-" angle for starboard-high state.



Set to +5.0 when port side is higher than starboard side by 5 degrees.

4) TRIM ANGLE (-12.8 to +12.7°)

Compensates for fore-aft inclination of the transducer face. Set "+" angle for fore-high state and "-" angle for aft-high state.



Set to +5.0 when fore side is higher than aft side by 5 degrees.

5) GT SPD CALIB (-12.8 to +12.7%)

Calibrates ship's speed in the ground tracking mode. True speed should be calculated at the sea trial. Refer to page 4-32. Calibration value is obtained as follows:

$$\text{Calibration value} = \frac{\text{True speed} - (\text{CI-60/G Speed})}{\text{True speed}} \times 100$$

6) WT SPD CALIB (-12.8 to +12.7%)

Calibrates ship's speed in the water tracking mode. In general, enter the same value as the GT SPD CALIB.

7) BEARING CALIB (-12.8 to +12.7°)

Calibrates bearing offset angle of the transducer. When the transducer's fore-aft axis is deviated to starboard from the ship's fore-aft line, set a positive angle.

8) COURSE CALIB (-12.8 to +12.7°)

Calibrates bearing error of gyro data. If you know your gyro north is deviated from true north, enter the offset angle manually. (There is the way to calibrate the offset automatically. Refer to Menu 4 descriptions.)

9) EXT KP1 DIST/EXT KP2 DIST (0 - 25.6 m)

These are for rejecting interference from other sounding devices. Enter the distance between the interfering transducer (source of KP1 or KP2 input) and CI-60/G transducer. For further details, see pages 4-28 through 4-31.

4.7 Menu 4 Screen (Available on CI-60G only)

The function of menu 4 is mainly for current processing in nav-aided mode.

Current Processing (Nav-Aided Mode)

If the ground echo can not be detected in deep water, the unit automatically switches to the water tracking mode. In this mode, the equipment measures tide difference between the reference layer (near-surface) and target layer, but not the actual current (speed and direction). However, if ship's position data (lat/long) or speed/course data is available from a high precision navaid (GPS), the absolute ship's speed can be calculated, and thus the measurement of true current.

| * MENU 4 * | ◆ KNOB ITEM, | ◀▶ KNOB SETUP | END: MENU KEY |
|----------------|--------------|---------------|--------------------|
| Oct/15/1991 | | | |
| MENU MODE : | MENU1 | MENU2 | MENU3 MENU4 |
| TIME DATA : | INT | EXT | |
| WT SPEED : | T/D | NAV-TIDE | |
| NAV FORMAT : | CF | NMEA | |
| NAV AID : | GPS | LORAN-C | DECCA DR |
| | LORAN-A | ALL | |
| NAV DATA : | L/L | SPD | |
| TIME INT : | 1 min | | |
| CRS CAL MODE : | GT | NAV | MAN |
| CRS CAL EXEC : | START | | |
| TIDE OUT INT : | 15 sec | | |

Fig. 4-15 Menu 4 Screen

1) TIME DATA

Select EXT when an external equipment has more precise time (for example, GPS). Note that the update timing of time display depends on the incoming data interval.

2) WT SPEED

Selects which mode to use when ground echo is unavailable; water-tracking mode or nav-aided mode. When position data (or speed/course data) is not available, or receiving condition of the connected navigator is poor, select T/D (Tide Difference). Otherwise, select NAV-TIDE.

3) NAV FORMAT

Select the data format according to navigation equipment connected; Furuno CIF or NMEA0183. (It is recommended to apply CIF data, if available, because of its faster update interval and higher data resolution.)

4) NAV AID

Select navigation equipment to be used as a position (or speed) sensor. Select ALL if several navigation devices are used. Then, the unit selects navigation input in order of priority; GPS is the highest priority, LORAN-A the lowest.

GPS: GPS Navigator

LC: Loran C Navigator

DC: Decca Navigator

DR: Dead reckoning

LA: Loran A Navigation equipment

Note: Position (or speed) sensed originally by Loran A or dead-reckoning can not be used for nav-tide measurements. Only GPS or Loran C based data pretending to be DR or LA data may be used for nav-tide reference.

5) NAV DATA

When the GPS navigator GP-500 or GP-70 is connected select SPD (Speed). Select L/L for other equipment. For L/L, tracking is slower because ship's speed is calculated by using L/L data.

6) TIME INT

If "L/L" is selected as 'NAV DATA' in preceding item, specify the averaging time interval for converting L/L change into ship's speed/course. (1 to 10 minutes in 1 minute steps) 1 minute will be suitable to work with Loran C/GPS.

7) CRS CAL MODE

Selects a course calibration method and the course calibration mode to use. Course calibration is for compensating gyro error, and is very important for reliable nav-tide measurements. Refer to page 4-xx for making course calibration.

GT:

Compensates gyro error to equalize the course-made-good (for 2 mile-run) by ground tracking and that by navigator.

NAV:

Compensates gyro error to equalize the tides before and after 10 minute-run in a limited area.

MAN:

Compensates gyro error by using the value entered manually in Menu 3 (COURSE CALIB).

8) CRS CAL EXEC

Used to calculate course calibration angle if "GT" or "NAV" is selected in preceding 'CRS CAL MODE'. Refer to page 4-35 for making course calibration.

9) TIDE OUT INT

Specifies data output interval if a data logging device is connected to the AUX port. (15 sec, 20 sec, 1 min, 2 min, 5 min or 10 min)


Note that the CIF and NMEA data output intervals are not affected by this setting.

4.8 External Noise and Interference Check

4.8.1 External Noise Check

Noise level can be measured (without transmission) at the echo check screen.

1) Preparation

1. Remove the 10A fuse in the power block of the transceiver unit. See Fig. 4-1.
2. Dismount the JTX board. See Fig. 4-1.
3. Execute the echo check. See pages 4-10 and 4-15.
4. Turn TVG SET off by operating the [MODE] key.
5. Set the ECHO DEPTH at 400 m by operating the [] knob.

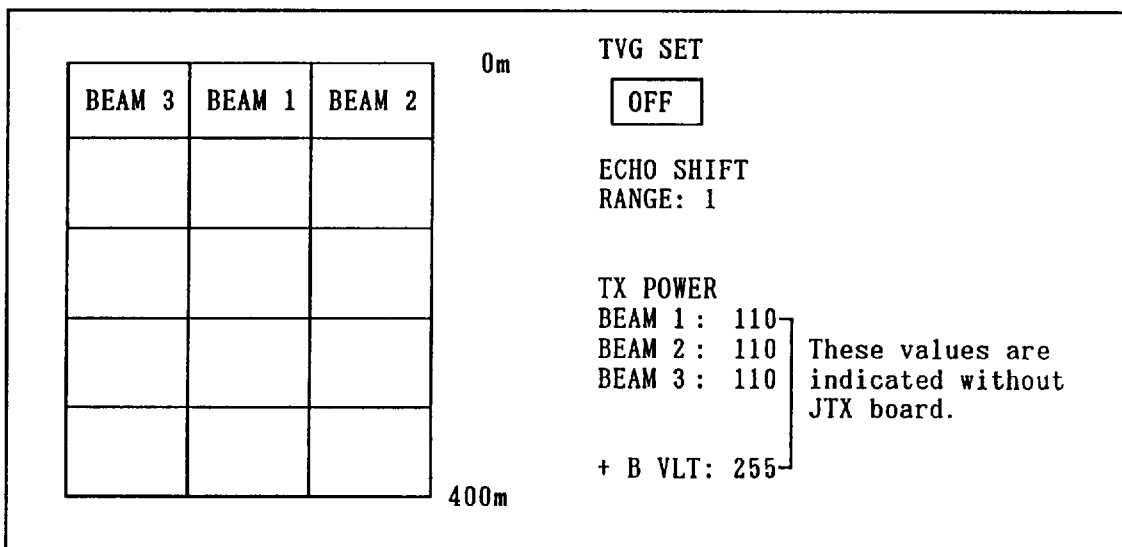




Fig. 4-16

2) Check at mooring

1. Adjust the ECHO SHIFT RANGE by the [ ] knob, noting the ECHO SHIFT RANGE when the color of echograms change from blue to black.
2. This value should be 7 or higher at normal noise level. If the value is less than 7, noise is excessive.

3) Check at cruising

1. Continuing the echo check with the same value of ECHO SHIFT RANGE, change the ship's speed.
2. Observe the echogram. The echogram is presented in 16 color gradations and one level of gradation corresponds to twice the input level. The color depends on the input level as follows:

Black (lowest) → blue → light-blue → cyan → light-cyan → light-green → green → yellow-green → yellow → yellow-orange → orange → vermilion → red → reddish brown → brown → dark brown (highest)
3. Confirm that the noise levels are almost even on all three beams and pulse-like periodic noise does not appear.
4. If the color changes by more than 4 gradations than that at mooring, the noise level is excessive. In this case check the ground of each unit. (If the cruising noise is too heavy, you must consider the transducer relocation or reshaping.)

4.8.2 Interference Check

Perform this check where the depth is greater than 50 meters (preferably about 100 meters) and there are no other ships.

1. Turn off all ultrasonic wave generating equipment (echosounder, sonar, etc).
2. Operate the CI-60/G in the ground tracking mode. Confirm that the indications of ship's speed and direction are reasonable.
3. Observing the display, turn on and operate the echo sounder and sonar one by one with its output power and pulse length set at the maximum. For the sonar, change the tilt and train angles.
4. If the display changes abnormally when some equipment is turned on and operated, that equipment is interfering with the CI-60/G.
5. The interference can be removed by connecting the interfering equipment to the built-in interference rejector in the transceiver unit, as explained on the next page.

Note: Use of the Interference Rejector reduces the response against the change of tidal speed.

How to check the level of an interfering signal

1. Set the equipment as described in paragraph 4.8.1 1). Set the ECHO SHIFT RANGE to the value which the color of the echograms just change from blue to black.

2. At a depth greater than 50 meters, operate other equipment (echo sounder, sonar) one by one and observe the echogram on the echo check screen.
3. When there is interference, string-like echoes appear on the screen.

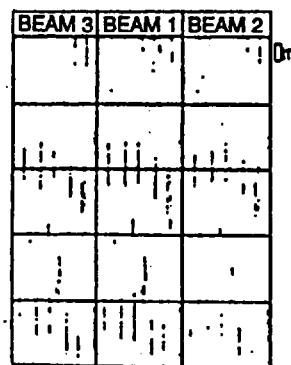


Fig. 4-17

4.8.3 Interference Rejection

Up to two interfering equipments can be connected to the interference rejection circuit in the transceiver unit. This circuit receives the keying pulse (KP) from the interfering equipment to reject interference.

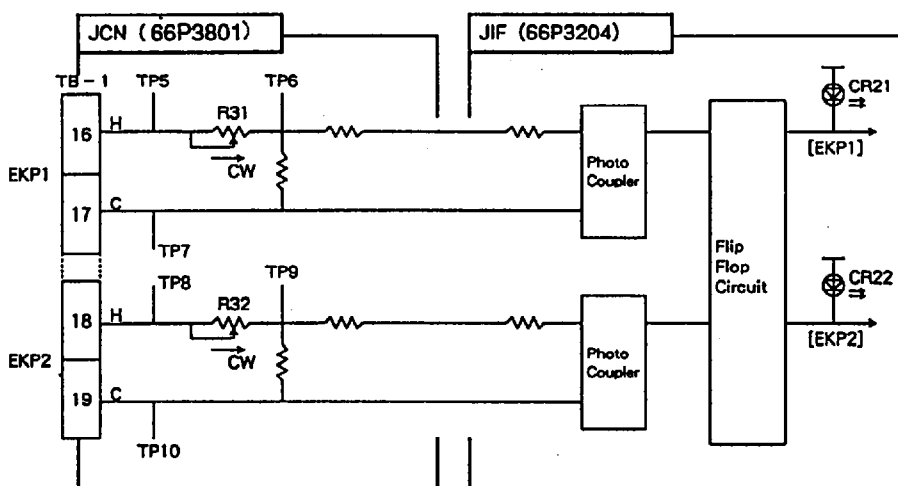


Fig. 4-18

(1) Check of keying pulse

The following keying pulse is required from the interfering equipment.

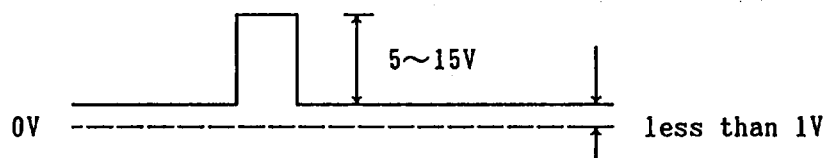
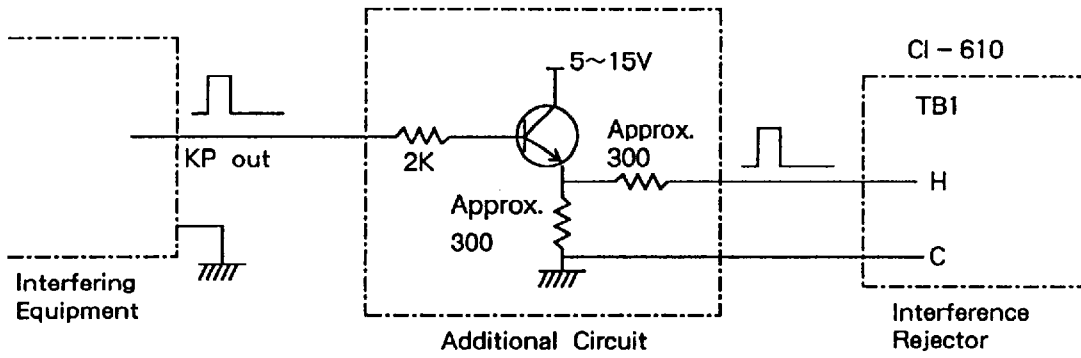


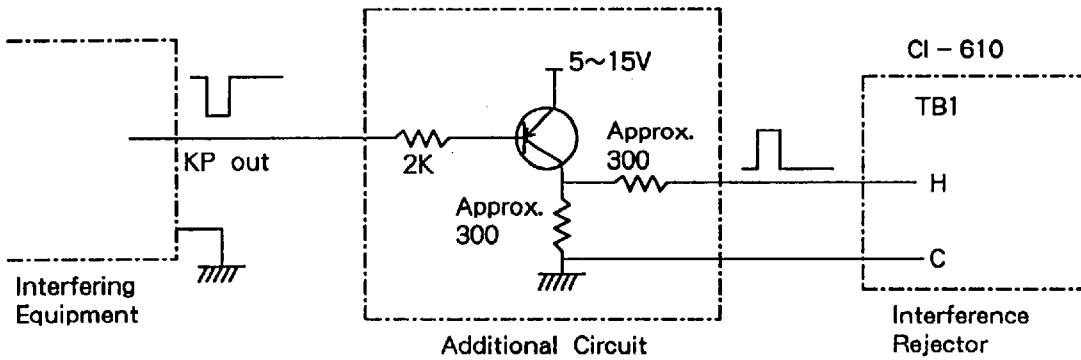
Fig. 4-19 Keying pulse needed

If the level is out of the ratings or KP output circuit is not provided, take the measures shown on the next two pages to prevent equipment malfunction.

- Buffer circuit for positive going KP.



- Buffer circuit for negative-going KP.



The following method also is available.

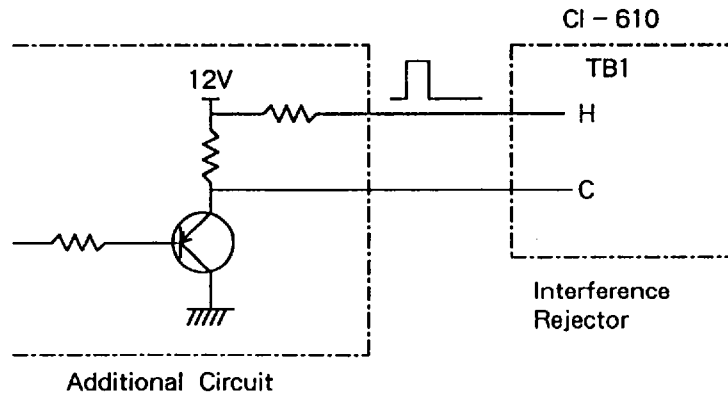


Fig. 4-20 Buffer Circuit for Keying Pulse (KP)

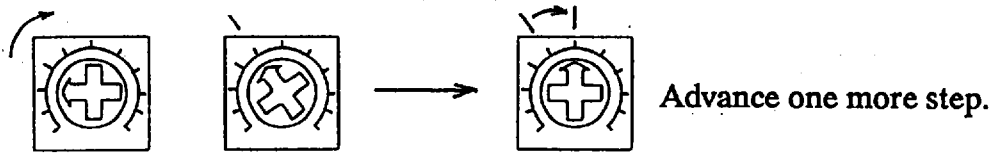
2) Adjustment

1. Set DIP switch S3 on the JIFA board 66P3800 as follows:

- A. When a KP is connected to EX KP (1) of TB1, set S3-#3 ON.
- B. When a KP is connected to EX KP (2) of TB1, set S3-#4 ON.
(Refer to the interconnection diagram on pages S-1 and 4-19.)

2. Adjust the potentiometer on the JCN board 66P3801 as follows:

- A. When KP is fed to EX KP1;
Turn R31 on the JCN board CW gradually until CR21 on the JIFA board starts flickering. Then, turn R31 CW by one more step.



CR21 starts flickering

- B. When KP is fed to EX KP2;
Adjust R32 until CR22 starts flickering. Then, turn R32 CW by one more step.

3. Enter the distance (0.1 m) between the transducer of the CI-60/G and that of the interfering equipment at the menu 3 screen. Refer to page 4-23.

- A. For EX KP 1, set it at EX KP 1 of the menu 3 screen.
- B. For EX KP 2, set it at EX KP 2 of the menu 3 screen.

Then, when the receive time of the transmission pulse of the interfering equipment coincides with a measuring period of current, receive data of that period is ignored, thus avoiding interference.

4.9 Sea Trial Check

4.9.1 Ship's Speed Test

Do the milepost test where ground tracking measurement can be done.

1. Reset the distance run at the moment the milepost test is initiated.
2. Read the distance run at the moment the milepost test is completed.
3. Calculate true ship's speed from the data of the milepost test and ship's speed of the CI-60/G from that of the distance run.
4. If the error is more than $\pm(1\% + 0.1 \text{ kt})$, correct it, referring to page 4-24. Record the data in Table 1.
5. Repeat the milepost test several times, and confirm that the error is within $\pm (1\% + 0.1 \text{ kt})$.
6. Record the ship's speed every 10 seconds in table 2.
7. Calculate the average ship's speed from the data in the table 2 to compute unit accuracy.

4.9.2 Current Information Check

Confirm that current speed/direction display is uniform in all directions and does not change whatever the ship's heading. Use the ground tracking mode to record the data.

- * Before beginning this test, set TIDE AVERAGE to 2 minutes and TIDE HISTORY to 15 seconds at menu 1.
 - * At sea trial, the ship's draft is shallow due to no "load," so air bubbles may affect equipment performance.
1. Run your boat at a speed around 12 kts, following square course shown below. Each side of the square is about 1 mile in length. It should take about 5 minutes to cover one side of the course. After completing a side of the course, turn, wait for course to stabilize, then run straight for five minutes.

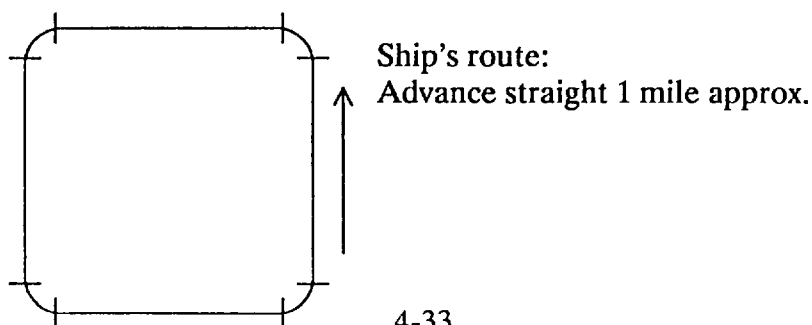


Fig. 4-21

2. Record the ship's speed and tide data every 30 seconds in table 3. As a general rule, set the Mode to North Up. Only when there is no gyro signal should the data be recorded using the Heading Up Mode. If a wind meter is available, record the speed and direction of the wind.
3. On a separate of paper, plot the current speed and direction. Confirm the current reading is stable in any ship's heading.
Instead of plotting on paper, you may use the tide history function of CI-60/G. Just after completion of test route, press the [HISTORY] key and observe the tide history. If it is working normally, the tide vectors should point almost constant direction.

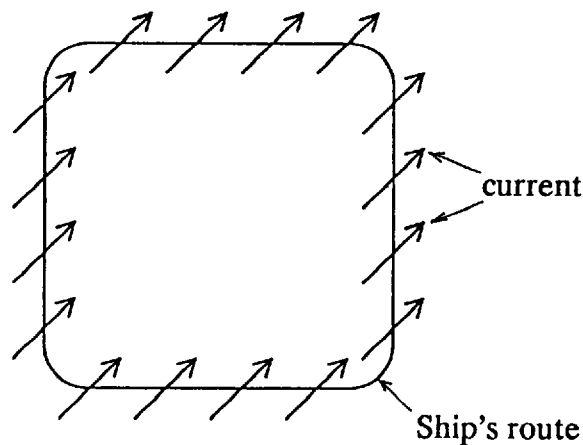


Fig. 4-22

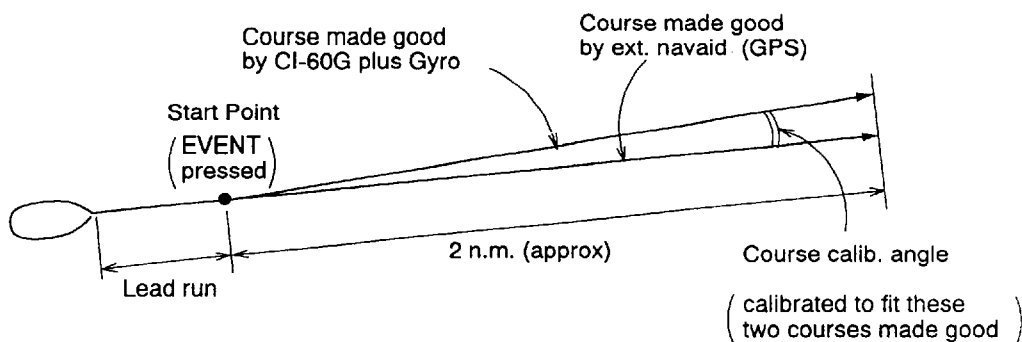
Caution

1. *When a "bearing sensor" is connected in lieu of a gyrocompass, accurate measurement of current direction is not expected because the bearing data itself is in error.*
2. *Because current speed/direction differ with season, sea area, and time of day, be sure to look at the entire data rather than just portions of it.*

4.9.3 Course Calibration (CI-60G only)

The CI-60G has the nav-aided mode to measure absolute tides even in deep waters where ground tracking is unattainable. To achieve reliable measurements, however, you must supply accurate heading (gyro) information and ship's position (or speed/course) data to CI-60G. After installation, perform the course calibration to offset gyro data. (The calibration should be done by using ground tracking mode.)

1. Confirm that the gyrocompass has settled and all the necessary compensations (latitude compensation, weather compensation, etc.) are made correctly.
2. Manipulate the AD converter (gyro interface) to obtain the same reading as you read on the master gyrocompass. (Do not make adjustment while the ship is turning.)
3. Make sure the navaid (GPS) is working correctly and accurately.
4. Press the TRACKING MODE key to select "GT" (ground tracking) mode.
5. In Menu 4, set 'CRS CAL MODE" to "GT".
6. Run your boat at a speed around 10 kts, keeping the same direction. To minimize the effect of gyro speed error, it is preferable to run along parallels (i.e., eastward or westward).
7. In Menu 4, place the cursor on "START" (CRS CAL EXEC) and then press the EVENT key. As soon as you press the EVENT, "0.0" should appear in reverse text at the upper-right part of the display. After 2 mile-run, the display will show the course calibration angle in normal text.



8. Perform the preceding Current Information check, using nav-aided mode, and confirm that current speed/direction display is uniform in all directions and does not change whatever the ship's heading.

Table 1 Ship's Speed Test

SHIP'S NAME _____ TEST SITE _____ SHIP'S LENGTH _____ (m) DRAFT _____ Fore _____ Aft _____ Mean _____ (m)

| DATE | TIME | ENGINE OUTPUT | | *1 MILEPOST | | Current Indication | | | EM-LOG (kts) | DEPTH (m) | COURSE (Deg) | WIND (m/s) | SEA COND. | CURRENT (kts) | REMARKS |
|------|------|---------------|---------|-------------|--------------------|--------------------|-------------|--|--------------|-----------|--------------|------------|-----------|---------------|-----------------------------|
| | | RPM | TIME(s) | SPEED (kts) | *3 DIST. RUN (kts) | TIME(s) | *2 ERR. (%) | | | | | | | | |
| | | | | | | | | | | | | | | | |
| AVG. | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| AVG. | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| AVG. | | | | | | | | | | | | | | | MEASURING MODE GROUND WATER |
| | | | | | | | | | | | | | | | |
| AVG. | | | | | | | | | | | | | | | |

*2 Error = $\frac{\text{Speed measured by milepost} - \text{Current Indicator Speed}}{\text{Speed measured by milepost}} \times 100(\%)$

*1 Milepost miles
 *3 Current Indicator Speed = $\frac{\text{Mile (Milepost)}}{\text{Time (sec)}} \times 3600$

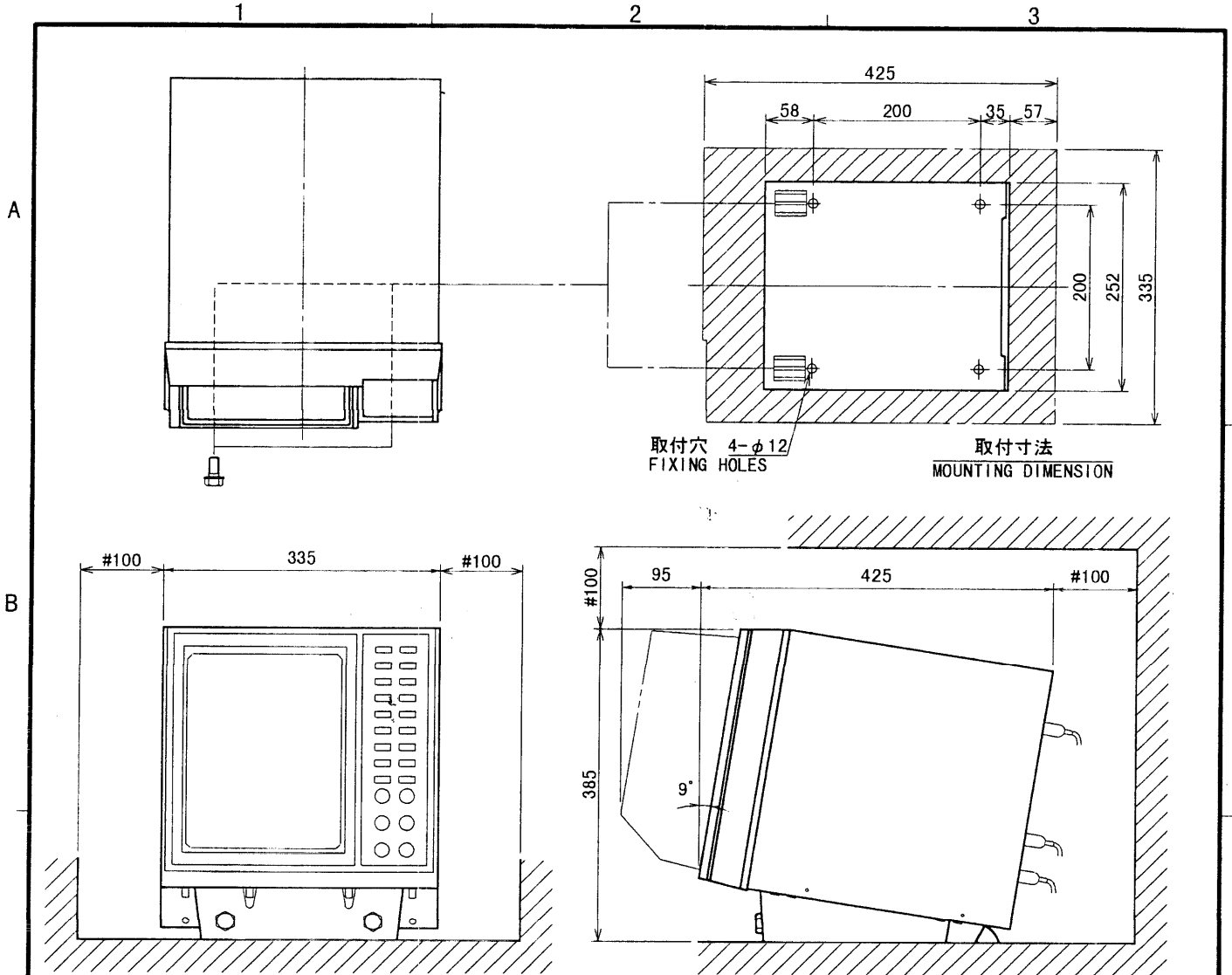
Table 2 Ship's Speed Test

| | TIME | SPD (kts) | REMARKS | | TIME | SPD (kts) | REMARKS |
|--|------|-----------|------------------------|--|------|-----------|------------------------|
| | 00 | | SHIP'S NAME _____ | | 00 | | SHIP'S NAME _____ |
| | 10 | | DEPTH _____ (m) | | 10 | | DEPTH _____ (m) |
| | 20 | | TEST SITE _____ | | 20 | | TEST SITE _____ |
| | 30 | | WIND SPEED _____ (m/s) | | 30 | | WIND SPEED _____ (m/s) |
| | 40 | | △ _____ (m/s) | | 40 | | △ _____ (m/s) |
| | 50 | | COURSE _____ | | 50 | | COURSE _____ |
| | 00 | | | | 00 | | |
| | 10 | | | | 10 | | |
| | 20 | | | | 20 | | |
| | 30 | | | | 30 | | |
| | 40 | | | | 40 | | |
| | 50 | | | | 50 | | |
| | 00 | | | | 00 | | |
| | 10 | | | | 10 | | |
| | 20 | | | | 20 | | |
| | 30 | | | | 30 | | |
| | 40 | | | | 40 | | |
| | 50 | | | | 50 | | |
| | 00 | | | | 00 | | |
| | 10 | | | | 10 | | |
| | 20 | | | | 20 | | |
| | 30 | | | | 30 | | |
| | 40 | | | | 40 | | |
| | 50 | | | | 50 | | |
| | 00 | | | | 00 | | |
| | 10 | | | | 10 | | |
| | 20 | | | | 20 | | |
| | 30 | | | | 30 | | |
| | 40 | | | | 40 | | |
| | 50 | | | | 50 | | |
| | 00 | | | | 00 | | |

Table 3 Current Display Behavior Test

SHIP'S NAME _____ TEST DATE _____ TEST SITE _____ DEPTH _____
 SETTING (m): LAYER 1 _____, LAYER 2 _____, LAYER 3 _____

| No. | TIME | SHIP'S HDG. (deg.) | LAYER 1 | | LAYER 2 | | LAYER 3 | | SHIP'S SPD | | WIND (Rel) | | REMARKS (Depth, Sea conditions, etc.) |
|-----|------|--------------------|---------|-----------|---------|-----------|---------|-----------|------------|-----------|------------|-----------|---------------------------------------|
| | | | DIR | SPD (kts) | DIR | SPD (kts) | DIR | SPD (kts) | F/A (kts) | L/R (kts) | DIR (deg) | SPD (m/s) | |
| 1 | | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| 1 | | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | |



取付穴 4-φ12
FIXING HOLES

取付寸法
MOUNTING DIMENSION

表 1 TABLE 1

| 寸法区分 (mm) DIMENSION | 公差 (mm) TOLERANCE |
|------------------------|----------------------|
| 0 < L ≤ 50 | ±1.5 |
| 50 < L ≤ 100 | ±2.5 |
| 100 < L ≤ 500 | ±3 |

注記
1) 指定なき寸法公差は表 1 による。
#: 推奨するサービス空間寸法。

NOTE
1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS.
2. #: RECOMMENDED SERVICE CLEARANCE.

電源 SOURCE

背面 REAR VIEW

アース端子 GND TERMINAL

| | |
|------------------------------------|----------------------|
| DRAWN Apr 17 '00 Y. Yamashita | TITLE CI-600/600G |
| CHECKED Apr 17 '00 Y. Kurihara | 名称 指示器 |
| APPROVED Apr 17 '00 Y. Kurihara | 外寸図 |
| SCALE 1/8 MASS ±10% 21 kg | NAME DISPLAY UNIT |
| DWG. No. C7228-G01-F | OUTLINE DRAWING |

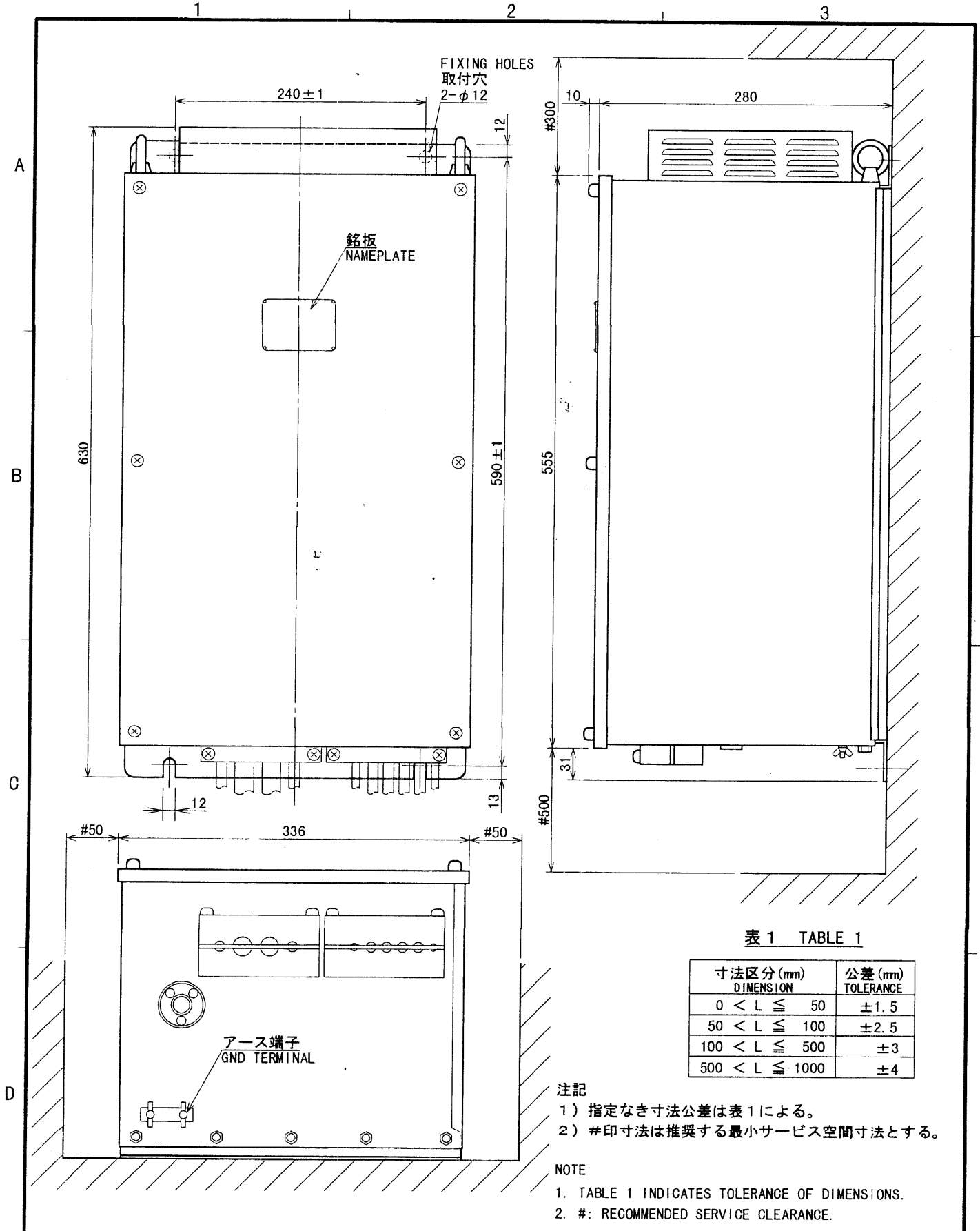


表 1 TABLE 1

| 寸法区分 (mm) DIMENSION | 公差 (mm) TOLERANCE |
|------------------------|----------------------|
| 0 < L ≤ 50 | ±1.5 |
| 50 < L ≤ 100 | ±2.5 |
| 100 < L ≤ 500 | ±3 |
| 500 < L ≤ 1000 | ±4 |

注記

- 1) 指定なき寸法公差は表 1 による。
- 2) #印寸法は推奨する最小サービス空間寸法とする。

NOTE

- 1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS.
- 2. #: RECOMMENDED SERVICE CLEARANCE.

| | | |
|---------------------------------|-----------------------|-------------------------|
| DRAWN Apr 17 '00 T. YAKASAGI | | TITLE CI-610/610G |
| CHECKED Apr 17 '00 Y. Kamin | | 名称 送受信演算部 |
| APPROVED Apr 17 '00 Y. Kamin | CI-60/60G | 外寸図 |
| SCALE 1/5 | MASS 33 ±10% kg | NAME TRANSCIVER UNIT |
| DWG. No. C7228-G02-E | | OUTLINE DRAWING |

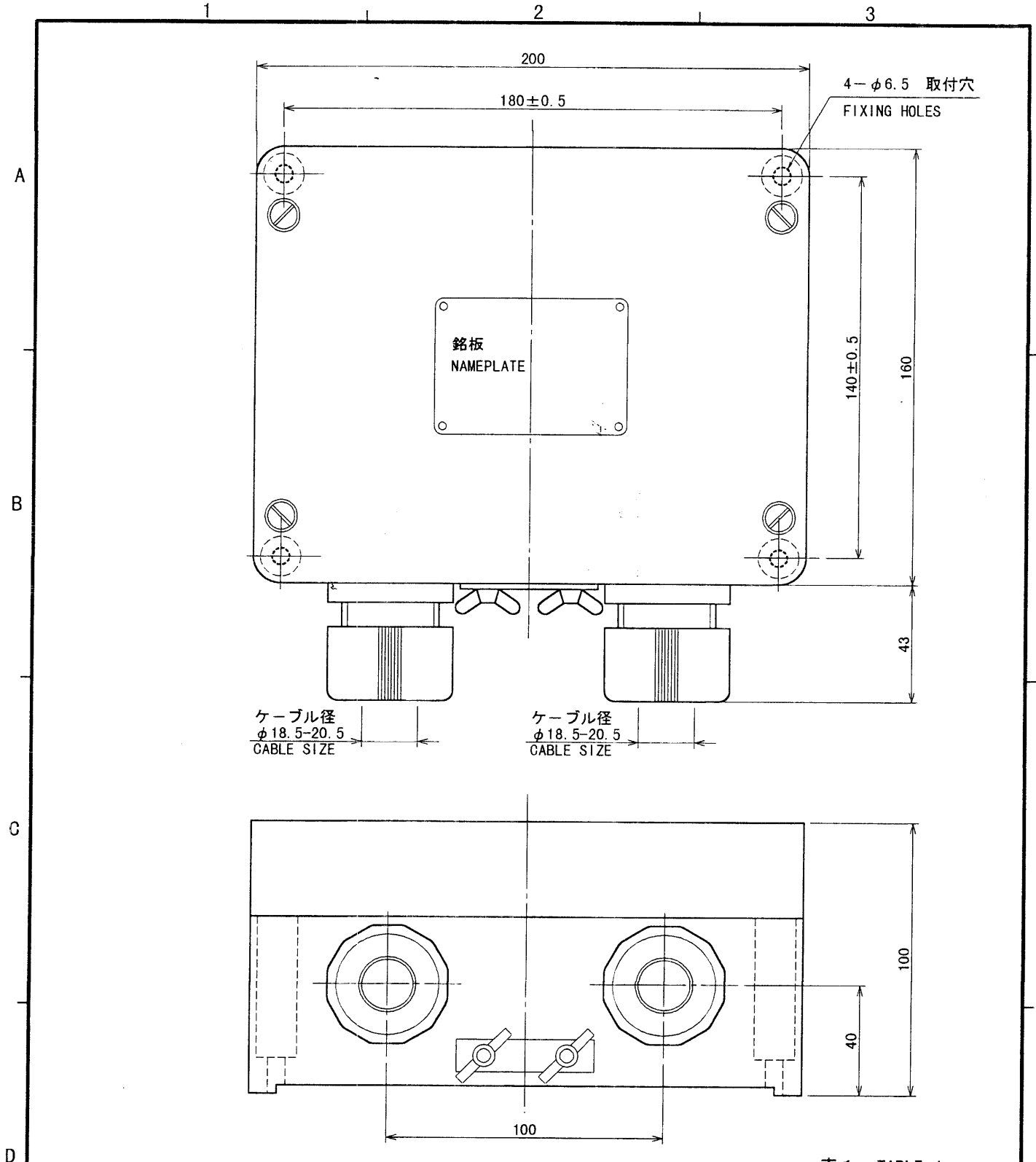


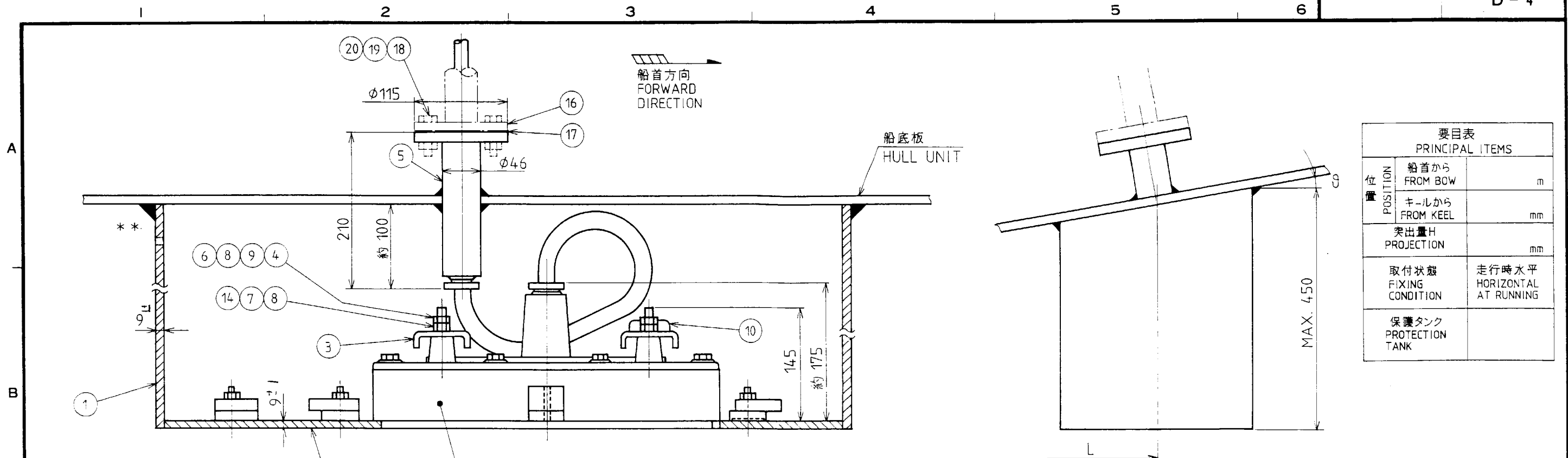
表 1 TABLE 1

| 寸法区分 (mm) DIMENSION | 公差 (mm) TOLERANCE |
|------------------------|----------------------|
| 0 < L ≤ 50 | ±1.5 |
| 50 < L ≤ 100 | ±2.5 |
| 100 < L ≤ 500 | ±3 |

注記 指定なき寸法公差は表 1 による。

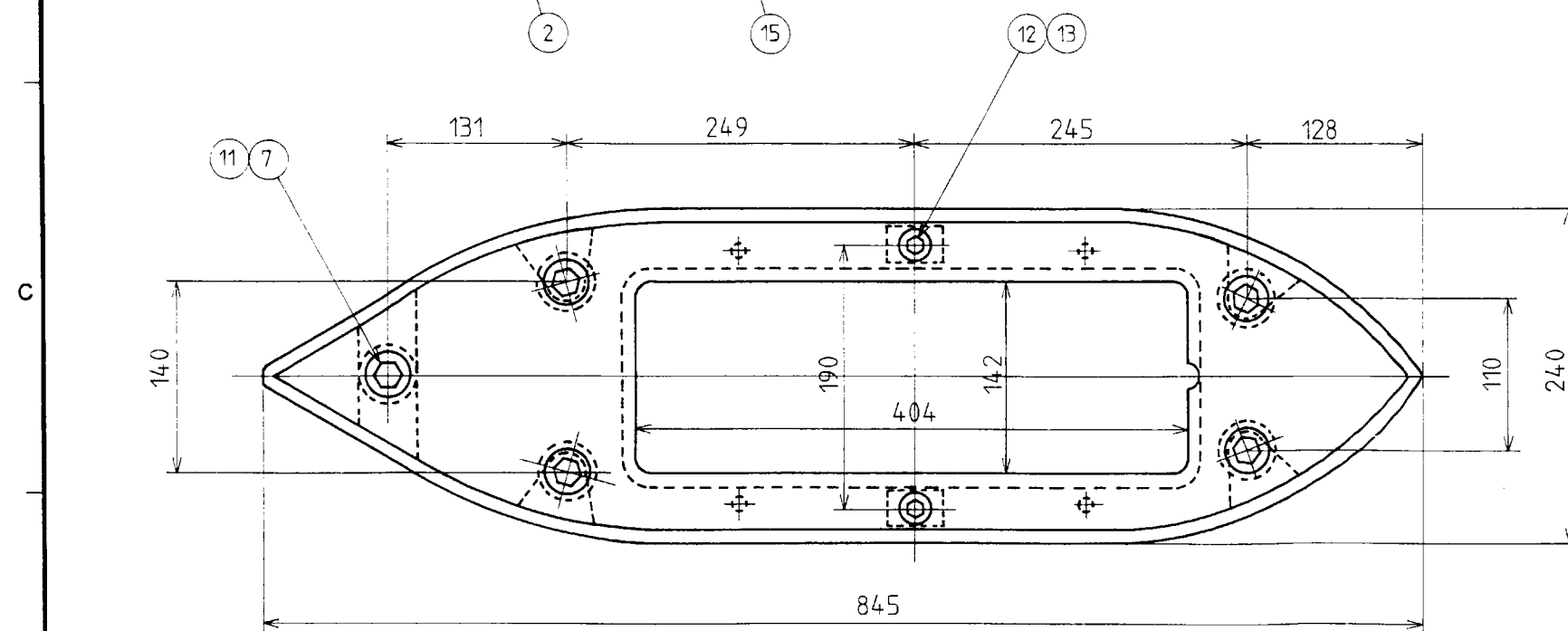
NOTE TABLE 1 INDICATES TOLERANCE OF DIMENSIONS.

| | | | |
|----------------------------------|----------------------|----------------------|--|
| DRAWN Apr. 17 '00 T. YAMASAKI | | TITLE CI-630 | |
| CHECKED Apr. 17 '00 Y. K. | | 名称 接続箱 | |
| APPROVED Apr. 17 '00 Y. K. | | 外寸図 | |
| SCALE 1/2 | MASS 2 ±10% kg | NAME JUNCTION BOX | |
| DWG. No. C7228-G03- D | | OUTLINE DRAWING | |



| 要目表 PRINCIPAL ITEMS | | |
|-----------------------------|-----------------------------------|----|
| 位置 POSITION | 船首から FROM BOW | m |
| | キールから FROM KEEL | mm |
| 突出量H PROJECTION | | mm |
| 取付状態 FIXING CONDITION | 走行時水平 HORIZONTAL AT RUNNING | |
| 保護タンク PROTECTION TANK | | |

注：指定なき公差は1.5%
TOLERANCE IS 1.5% UNLESS OTHERWISE SPECIFIED.



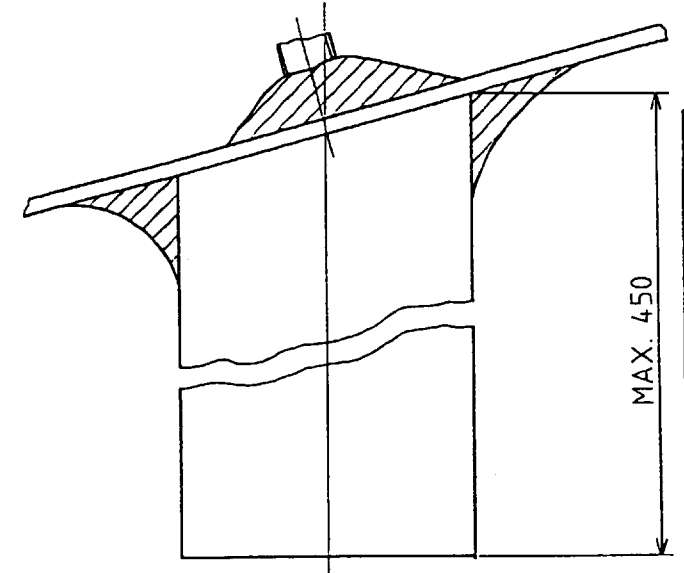
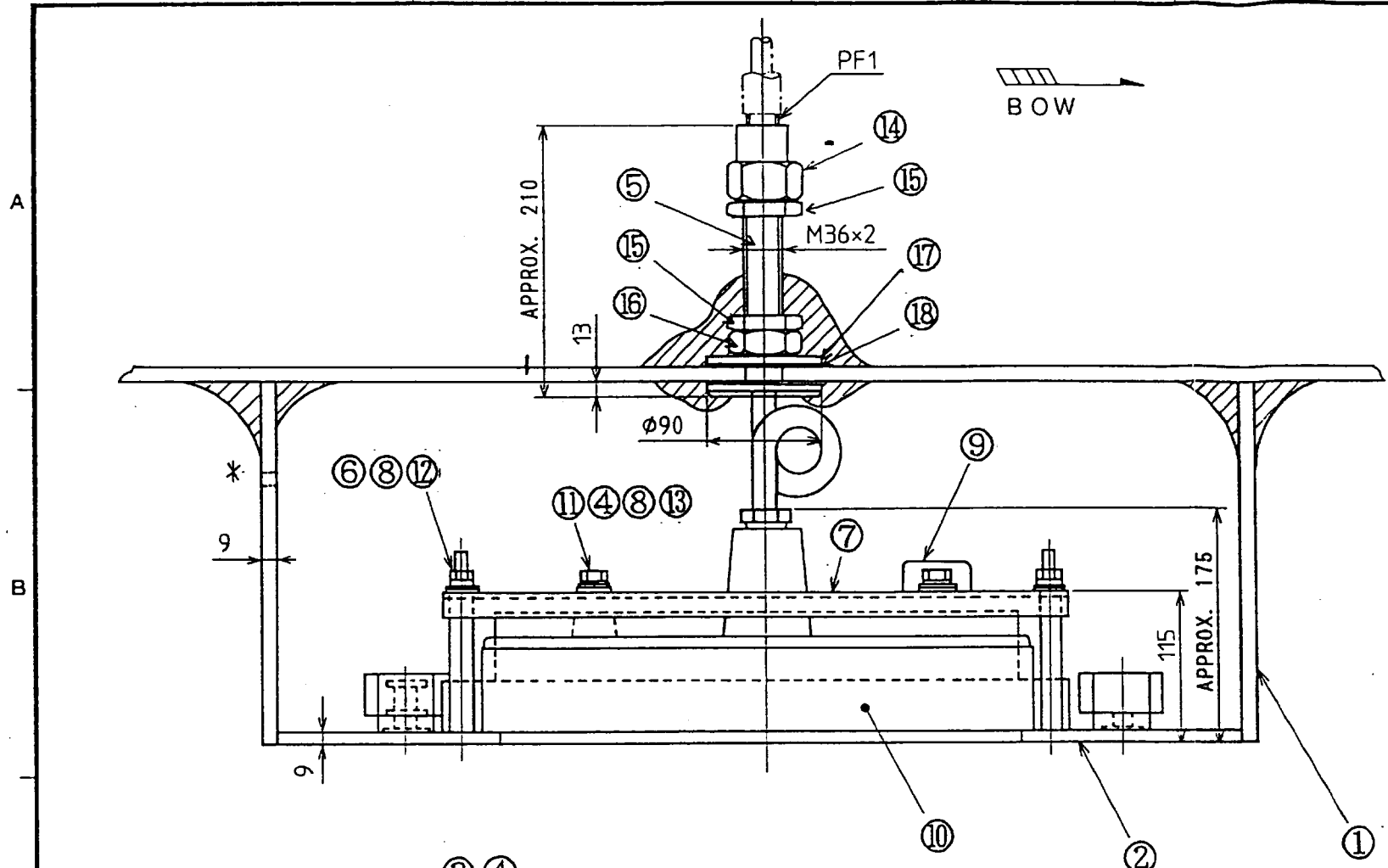
| 品番 ITEM | 品名 NAME | 材質 MATERIAL | 数量 Q'TY | 図番 DWG. NO. | 摘要 REMARKS |
|------------|-----------------------------|----------------|------------|--------------------------------|--------------------------|
| 20 | 六角ナット HEX. NUT | | 4 | M12 | ▲ |
| 19 | バネ座金 SPRING WASHER | | 4 | M12 | |
| 18 | 六角ボルト HEX. BOLT | | 4 | M12×40~50 | |
| 17 | パッキン GASKET | | 1 | | |
| 16 | 呼び圧力5K差込溶接式フランジ *9 | SS41 | 1 | JISB2220 呼び径φ20 | 造船所手配 SHIPYARD SUPPLY |
| 15 | 送受波器 TRANSDUCER | | 1 | 標準10mケーブル付 STD: W/10m CABLE | ▲ |
| 14 | 六角ボルト HEX. BOLT | SUS304 | 4 | M12×25 | |
| 13 | 六角ボルト HEX. BOLT | SUS304 | 2 | M8×40 | |
| 12 | バネ座金 SPRING WASHER | SUS304 | 2 | M8 | |
| 11 | 六角ボルト HEX. BOLT | SUS304 | 5 | M12×40 | |
| 10 | 防錆亜鉛 ZINC BLOCK | ZAP | 1 | B-1 1/2 | |
| 9 | 平ワッシャー FLAT WASHER | エポキシ RESIN | 4 | T-201-11 | |
| 8 | 平座金 FLAT WASHER | SUS304 | 4 | M12 | |
| 7 | バネ座金 SPRING WASHER | SUS304 | 9 | M12 | |
| 6 | 六角ナット HEX. NUT | SUS304 | 8 | M12 | |
| 5 | 電線貫通金物 THRU-HULL PIPE | SS400 | 1 | CI-620-K-S | |
| 4 | スペーサ SPACER | SGP | 4 | 66-017-1204 | |
| 3 | 押え板 FIXING PLATE | SGP | 2 | 66-017-1203 | |
| 2 | 送受波器取付フランジ FIXING FLANGE | SGP | 1 | 66-017-1202 | |
| 1 | 送受波器ケース CASING | SS41 | 1 | 66-017-1201 | 古野手配 MAKER SUPPLY |

- 注
- ※：造船所支給
 - 送受波器ケースはθ（船底傾斜角）に合わせて切断してください。
 - 切断・溶接の際は、歪防止のため送受波器を取り外した状態で“送受波器取付フランジ”を必ず取り付けておいてください。
 - ※※：船尾側上端に通水孔（φ10~φ20程度）を開けてください。
 - 電線貫通金物はフレーム等の邪魔にならない所で送受波器に当らず、キャップナットが容易に締付けられる位置に取付けてください。
 - 網除け、保護タンクは必要に応じて造船所にて製作して下さい。
 - 送受波器面は塗装しないように注意してください。
 - 送受波器ケース取付の際には船首、船尾の確認をしてください。
 - 質量は古野手配分のみで、タンク高さ450の場合を示す。

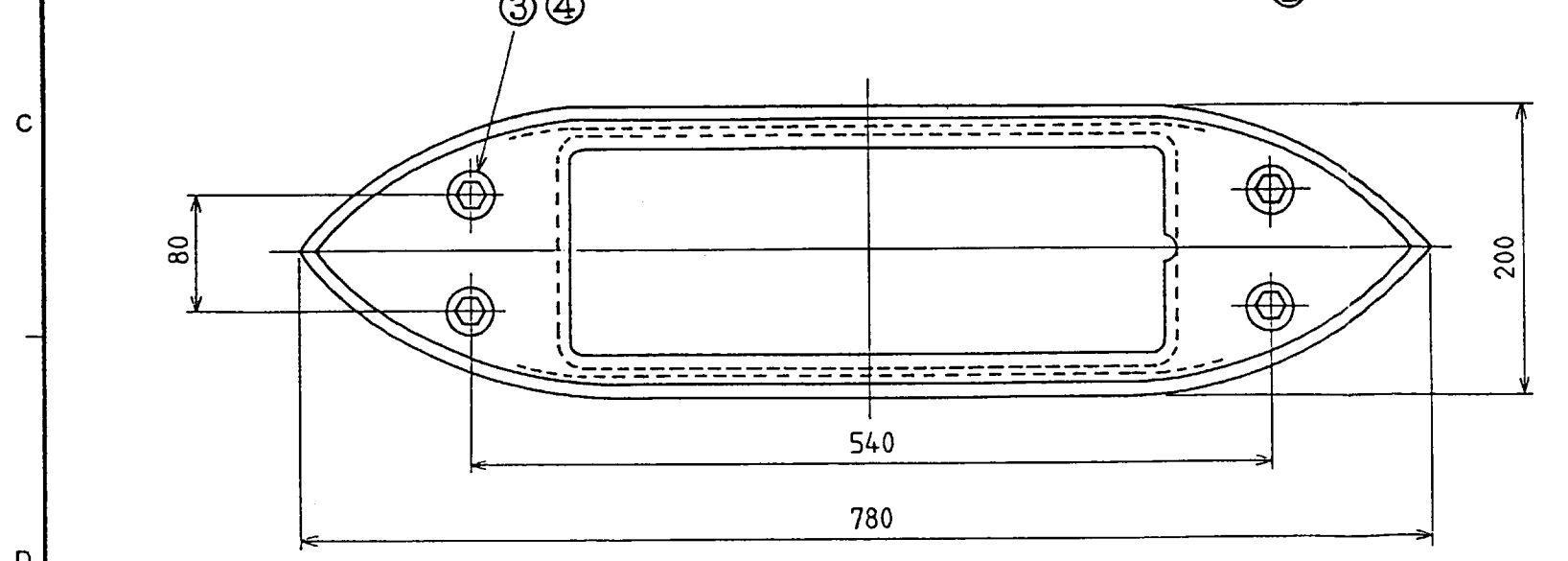
- NOTE
- ※：SHIPYARD SUPPLY.
 - CUT CASING FOR θ (RISING ANGLE OF SHIP'S HULL.)
 - TO AVOID DISTORTION BY HEAT, PUT "FIXING FLANGE" (WITHOUT TRANSDUCER) ONTO CASING WHILE CUTTING AND/OR WELDING.
 - ※※：MAKE A HOLE OF 10 TO 20MM IN DIA. ON STERN SIDE TO ALLOW WATER TO PENETRATE.
 - ALLOW ENOUGH CLEARANCE AROUND THRU-HULL PIPE FOR EASY TIGHTENING AND SERVICING.
 - IF NECESSARY, HAVE SHIPYARD PROVIDE NET PROTECTOR AND PROTECTION TANK.
 - DO NOT PAINT TRANSDUCER FACE.
 - CONFIRM FORWARD DIRECTION OF TRANSDUCER.
 - *9. STEEL WELDING PIPE FLANGE: JIS B 2220-5K-10-SS41

| | | | | |
|----------------|---------------------------|-------------------------------|-------------|--|
| 承認 APPROVED | APR. 24. '90 T. TAKASO | 三角法 THIRD ANGLE PROJECTION | 名称 TITLE | CI-620-T-S 送受波器装備図 (鋼船) TRANSDUCER INSTALLATION (STEEL HULL) |
| 検図 CHECKED | APR. 23. '90 M. IKEDA | 尺度 SCALE | 1/5 | |
| 製図 DRAWN | APR. 23. '90 TAKAHASHI | 質量 MASS | 94 kg | 図番 DWG. NO. C7228-T02-F |

| | | | | |
|----|--------|--------|---|------------|
| 18 | GASKET | RUBBER | 1 | TPB-1003 |
| 17 | WASHER | SS41 | 1 | TPB-1002-1 |



| PRINCIPAL ITEM | |
|------------------|-----------------------|
| POSITION | FROM BOW |
| POSITION | FROM KEEL |
| PROJECTION | |
| FIXING CONDITION | HORIZONTAL AT RUNNING |
| PROTECTION TANK | |



| ITEM | 品名 | 材質 | 数量 | 圖番 | 換要 |
|------|----------------|----------|------|---------------|---------------------|
| ITEM | NAME | MATERIAL | Q'TY | DWG.NO. | REMARKS |
| 16 | FIXING NUT | SS400 | 1 | TPB-1-03 | |
| 15 | LOCK NUT | SS400 | 2 | TPB-1-04 | |
| 14 | CAP NUT | SS400 | 1 | 66-017-1506-1 | |
| 13 | FLAT WASHER | PC | 4 | | |
| 12 | FLAT WASHER | RESIN | 4 | | |
| 11 | HEX. BOLT | SUS304 | 4 | | M12x25 |
| 10 | TRANSDUCER | | 1 | | STD: WITH 10m CABLE |
| 9 | ZINC BLOCK | | 1 | | |
| 8 | FLAT WASHER | SUS304 | 8 | | |
| 7 | FIXING PLATE | SS400 | 1 | | |
| 6 | HEX. NUT | SUS304 | 8 | | M12 |
| 5 | THRU-HULL PIPE | BC2 | 1 | 66-017-1501-0 | |
| 4 | SPRING WASHER | BC2 | 8 | | M12 |
| 3 | HEX. BOLT | SUS304 | 4 | | M12x40 |
| 2 | FIXING FLANGE | SS400 | 1 | | |
| 1 | CASING | FRP | 1 | | |

NOTE

- DECIDE PRINCIPAL ITEMS UPON DISCUSSING WITH SHIP'S OWNER OR SHIPYARD.
- CUT CASING FOR θ (RING ANGLE OF SHIP'S HULL).
- ALLOW ENOUGH CLEARANCE AROUND THRU-HULL PIPE FOR EASY TIGHTENING AND SERVICING.
- FRP MOLD THRU-HULL PIPE ON BOTH SIDES OF HULL PLATE.
- DO NOT PAINT TRANSDUCER FACE.
- FRP MOLD INSIDE OF CASING.
- BEFORE FIXING CASING TO HULL PLATE, FIRST CLEAN HULL PLATE SURFACE WITH A SANDER UNTIL FIBER GLASS APPEARS ON FACE. THEN REMOVE DUSTS, OILS AND SO ON FROM SURFACE.
- * MAKE A HOLE OF 10 TO 20MM DIA. ON STERN SIDE TO ALLOW WATER TO PENETRATE.

| | | | | |
|----------------|--------------------------|-------------------------------|-------------|--|
| 承認 APPROVED | APR. 24 '90 T. NAKAWO | 三角法 THIRD ANGLE PROJECTION | 名称 TITLE | CI-620-T-F TRANSDUCER INSTALLATION (FOR FRP) |
| 検 CHECKED | APR. 23 '90 M. IKEDA | 尺 SCALE | 1/5 | |
| 製 DRAWN | APR. 23 '90 TAKAHASHI | 重 WEIGHT | 46 kg | 圖番 DWG.NO. |
| | | | | E7228-T01-B |

| 寸法区分 (mm) DIMENSION | 公差 (mm) TOLERANCE |
|------------------------|----------------------|
| 0 < L ≤ 50 | ±1.5 |
| 50 < L ≤ 100 | ±2.5 |
| 100 < L ≤ 500 | ±3 |

表 1
TABLE 1

船首
BOW

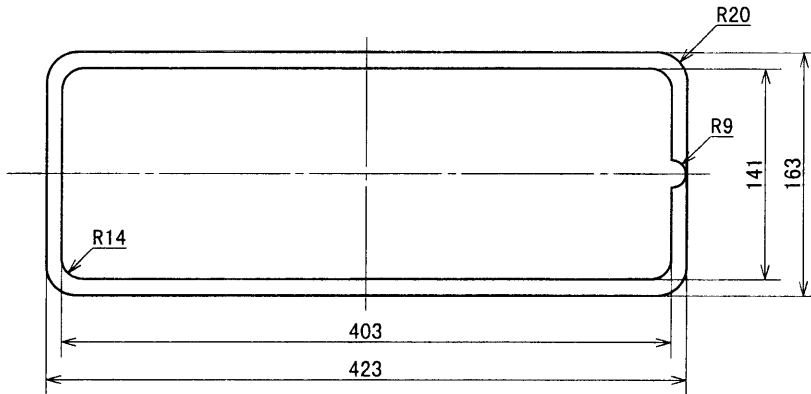
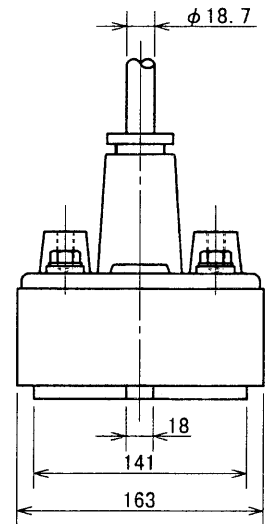
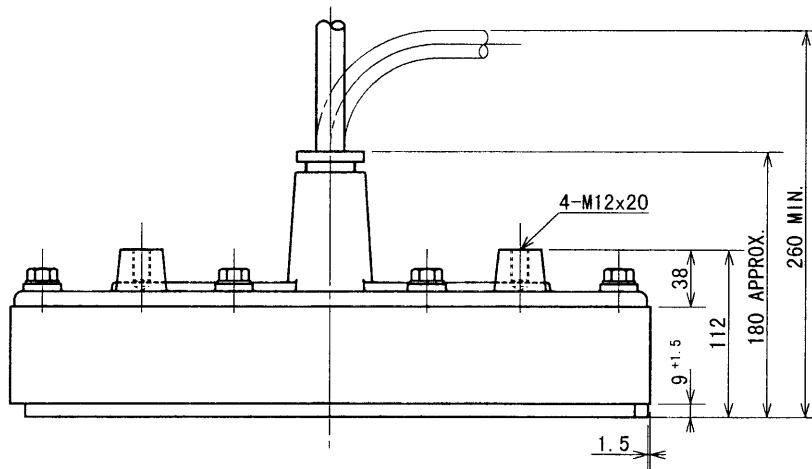
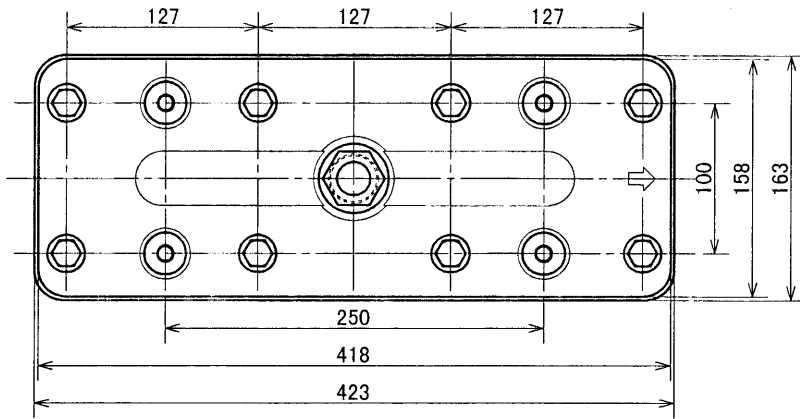
船首
BOW

A

B

C

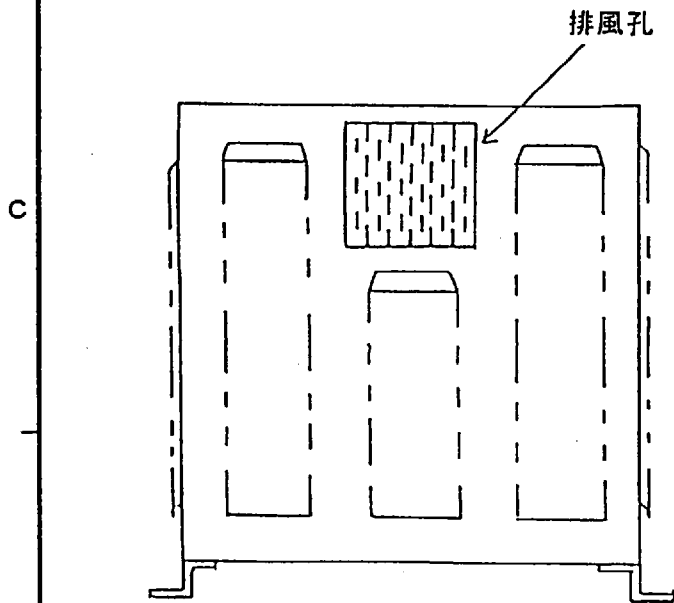
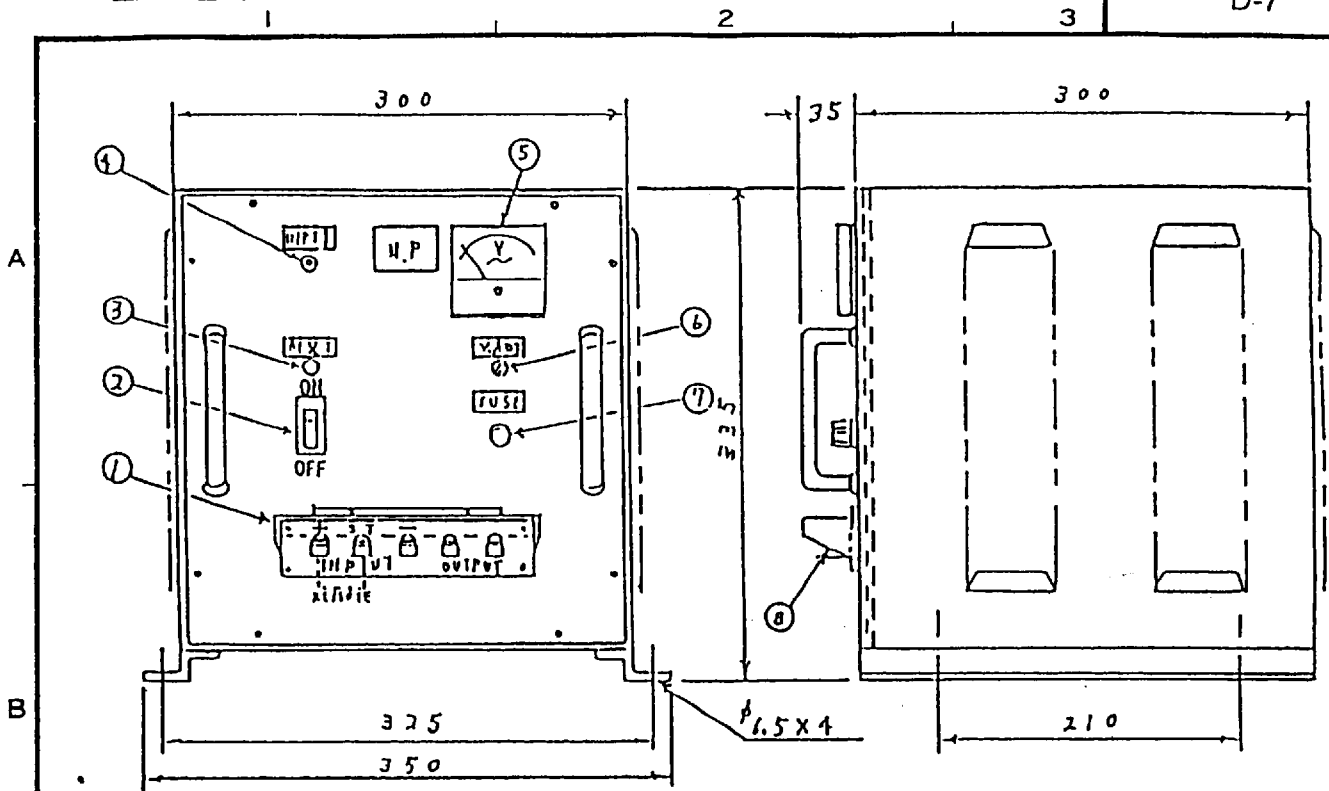
D



注記 1) 指定なき寸法公差は表 1 による。
NOTE 1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS.

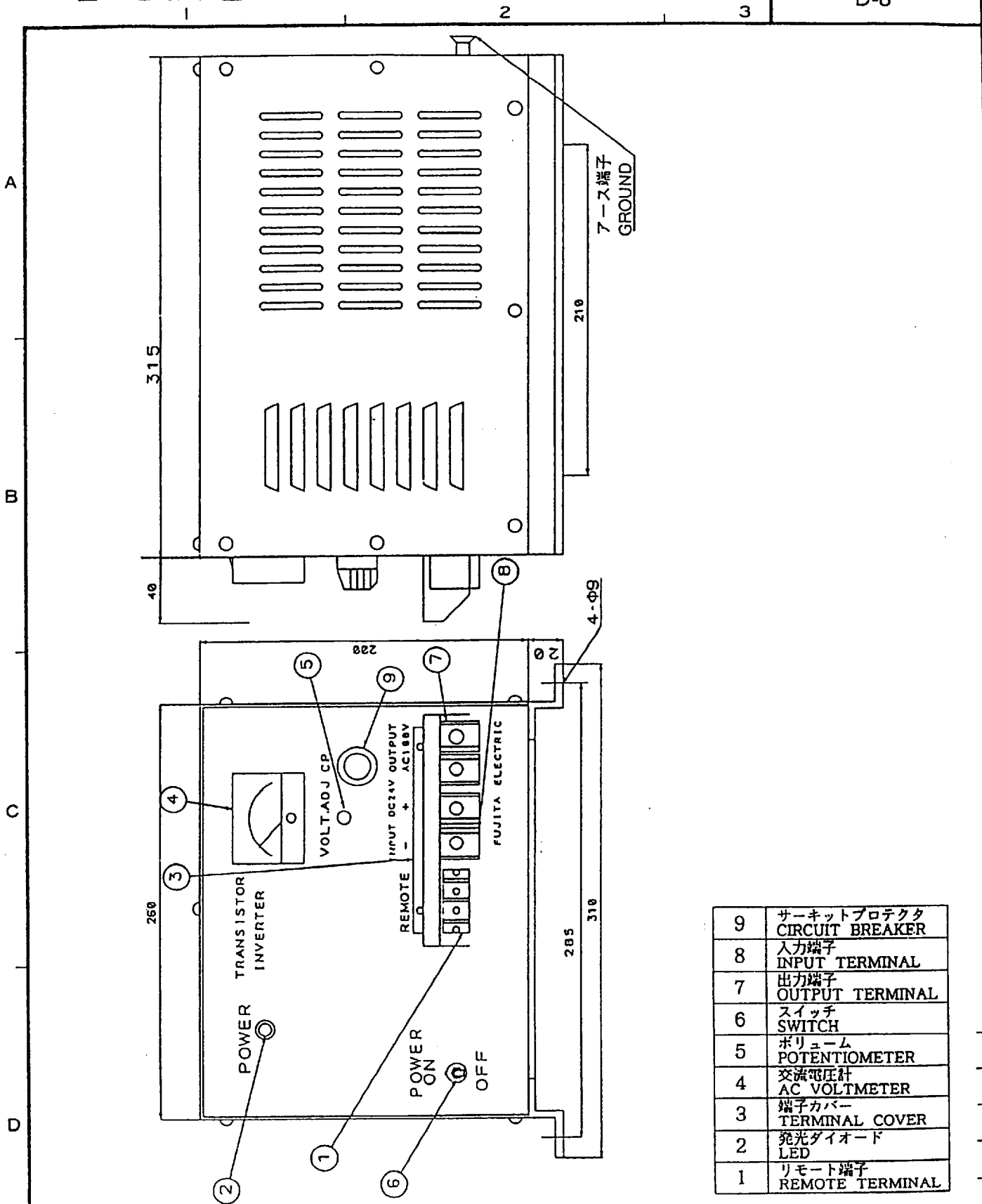
C1-620-1 : 21 kg (10mケーブル付 W/ 10m CABLE)
C1-620-2 : 26 kg (20mケーブル付 W/ 20m CABLE)

| | | | |
|--|------------|--------------------|--|
| DRAWN <i>Oct 1 '99 T. YAMAZAKI</i> | | TITLE C1-620 | |
| CHECKED <i>Oct 1 '99 K. KUSUNOKI</i> | | 名称 送受波器 | |
| APPROVED <i>Oct 1 '99 K. KUSUNOKI</i> | | 外寸図 | |
| SCALE 1/5 | MASS kg | NAME TRANSDUCER | |
| DWG. No. C7228-G04-E | | OUTLINE DRAWING | |



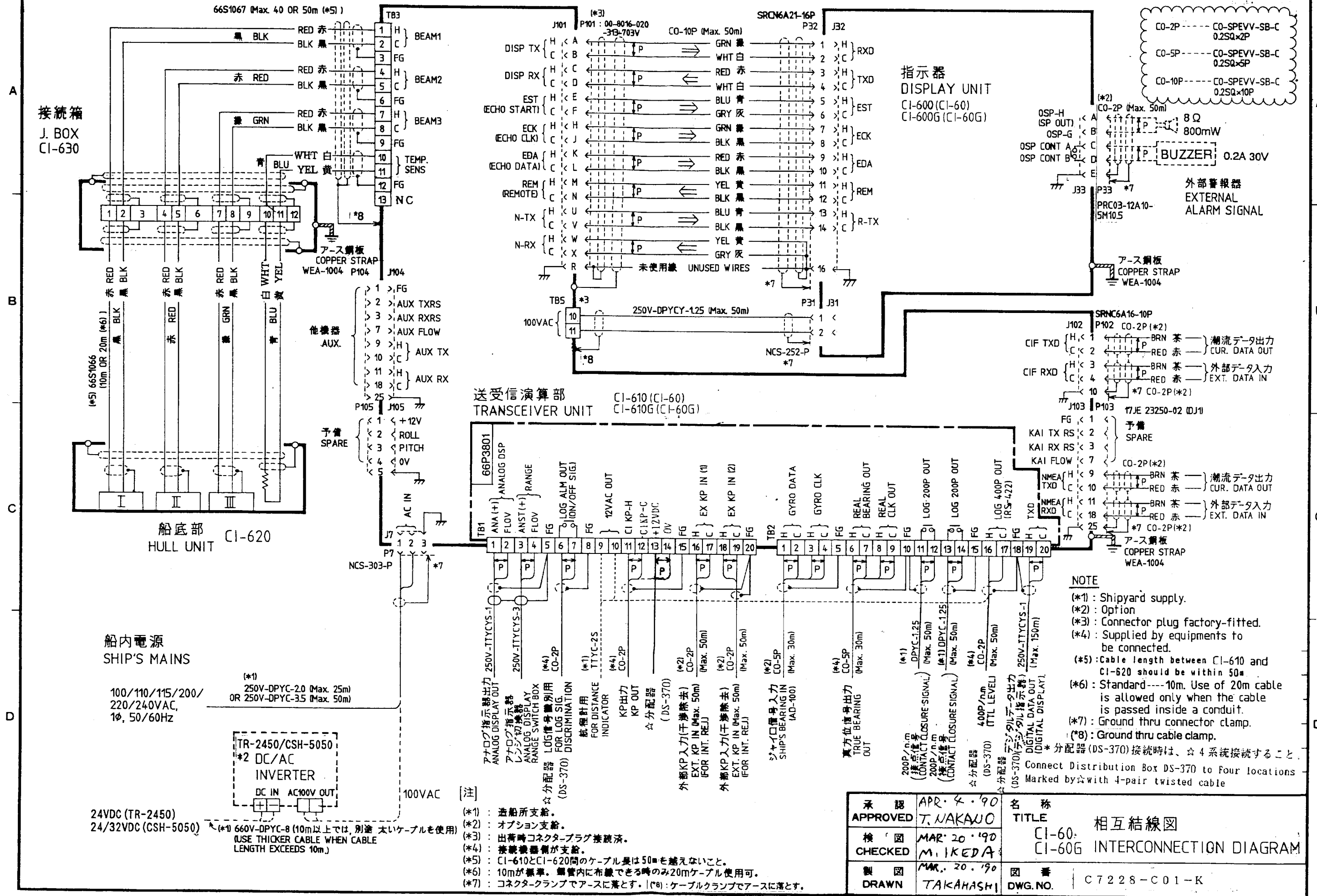
| 番号 | 部品名称 |
|----|-----------------|
| 1 | 入出力端子板 |
| 2 | 入力用ブレーカ兼用スイッチ |
| 3 | 過電圧防止用リセットスイッチ |
| 4 | 入力表示灯 (発光ダイオード) |
| 5 | 出力電圧計 |
| 6 | 出力電圧調整用ボリューム |
| 7 | 出力用ヒューズホルダー |
| 8 | 端子カバー |

| 承認 | 品番 | 品名 | 材質 | 数量 | 図番 | 摘要 |
|---------------------------|------|-------------------------------|----------|------|------------------------------|--|
| APPROVED | ITEM | NAME | MATERIAL | Q'TY | DWG.NO. | REMARKS |
| JUN. 25. '90 T. NAKAJI | | 三角法 THIRD ANGLE PROJECTION | | | | 名称 TITLE DC-AC インバーター TR-2450 DC-AC INVERTER |
| JUNE 25. '90 M. IKEDA | | 尺度 SCALE 1/5 | | | | |
| JUN. 25. '90 TAKAHASHI | | 重量 WEIGHT 35 kg | | | 図番 DWG.NO. C2007-G01-A | |



| | |
|---|-------------------------------|
| 9 | サーキットプロテクタ CIRCUIT BREAKER |
| 8 | 入力端子 INPUT TERMINAL |
| 7 | 出力端子 OUTPUT TERMINAL |
| 6 | スイッチ SWITCH |
| 5 | ボリューム POTENTIOMETER |
| 4 | 交流電圧計 AC VOLT METER |
| 3 | 端子カバー TERMINAL COVER |
| 2 | 発光ダイオード LED |
| 1 | リモート端子 REMOTE TERMINAL |

| 品番 ITEM | 品名 NAME | 材質 MATERIAL | 数量 Q'TY | 図番 DWG. NO. | 摘要 REMARKS |
|----------------|---------------------------|-------------------------------|---|----------------|-----------------|
| 承認 APPROVED | JUN. 15. '90 T. NAKAHO | 三角法 THIRD ANGLE PROJECTION | | | |
| 検図 CHECKED | JUN. 12. '90 T. GODA | 尺度 SCALE | 名称 TITLE DC/AC インバーター DC/AC INVERTER | | |
| 製図 DRAWN | JUN. 12. '90 M. USUDA | 重量 WEIGHT | 21 kg | 図番 DWG. NO. | C1273 - G08 - A |



接続箱
J. BOX
CI-630

船底部
HULL UNIT
CI-620

船内電源
SHIP'S MAINS

100/110/115/200/
220/240VAC,
1φ, 50/60Hz

TR-2450/CSH-5050
*2 DC/AC
INVERTER

24VDC (TR-2450)
24/32VDC (CSH-5050)

(*1) 660V-DPYC-8 (10m以上では、別途 太いケーブルを使用)
(USE THICKER CABLE WHEN CABLE LENGTH EXCEEDS 10m.)

送受信演算部
TRANSCIEVER UNIT
CI-610 (CI-60)
CI-610G (CI-60G)

指示器
DISPLAY UNIT
CI-600 (CI-60)
CI-600G (CI-60G)

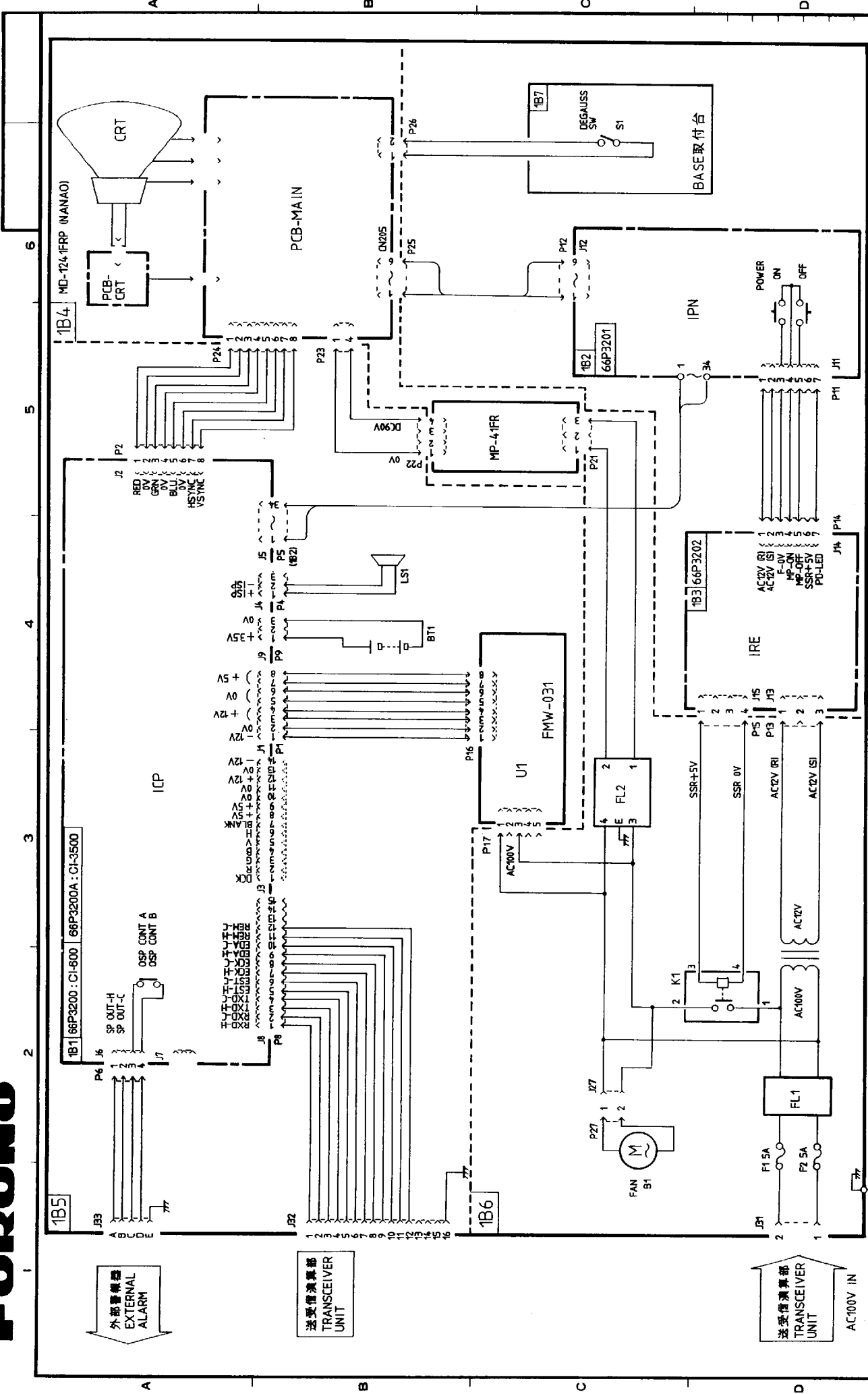
外部警報器
EXTERNAL
ALARM SIGNAL

NOTE

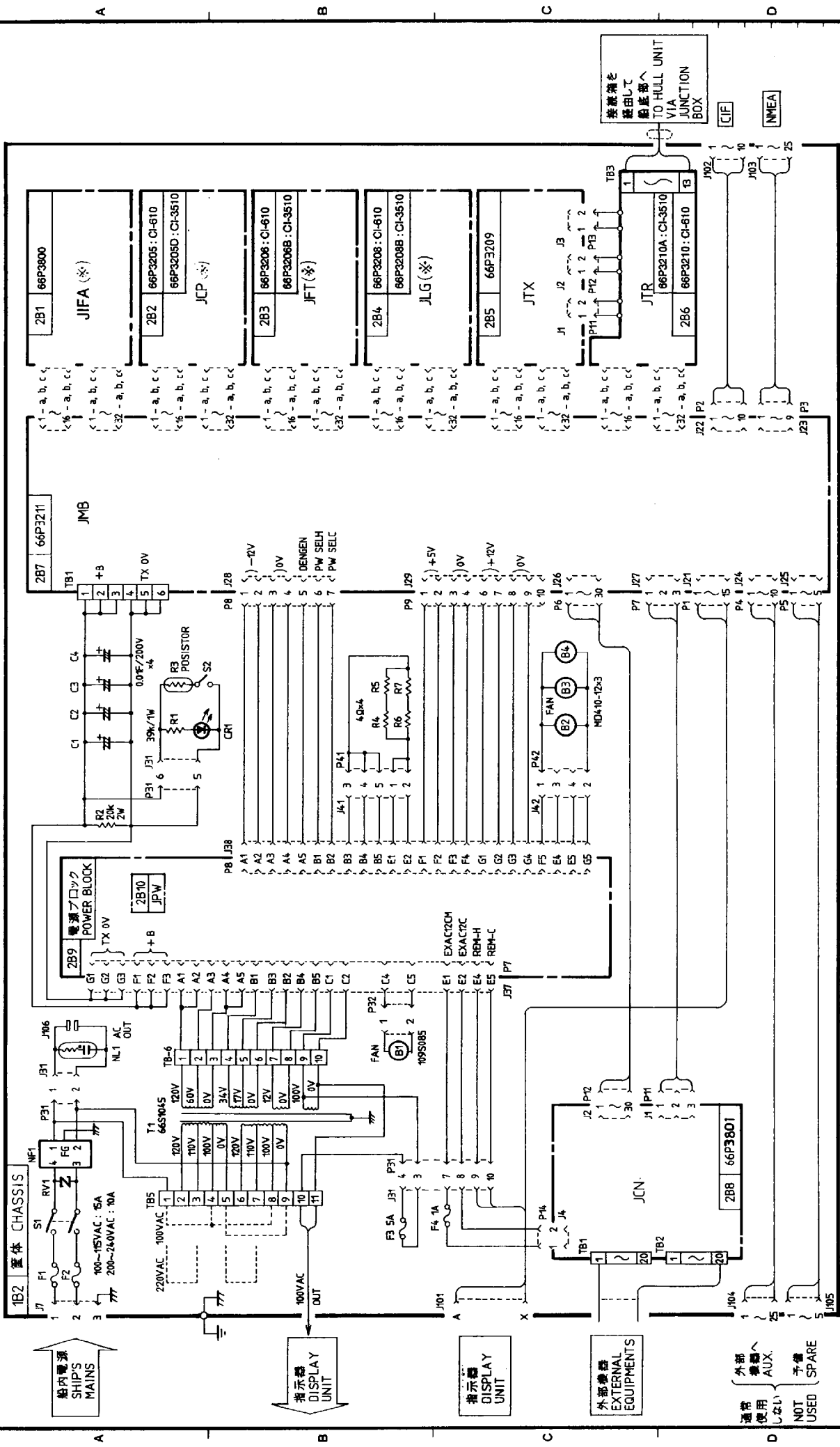
- (*1): Shipyard supply.
 - (*2): Option
 - (*3): Connector plug factory-fitted.
 - (*4): Supplied by equipments to be connected.
 - (*5): Cable length between CI-610 and CI-620 should be within 50m
 - (*6): Standard----10m. Use of 20m cable is allowed only when the cable is passed inside a conduit.
 - (*7): Ground thru connector clamp.
 - (*8): Ground thru cable clamp.
- * 分配器 (DS-370) 接続時は、☆4系統接続すること。
Connect Distribution Box DS-370 to Four locations Marked by☆ with 4-pair twisted cable

- [注]
- (*1): 造船所支給。
 - (*2): オプション支給。
 - (*3): 出荷時コネクタプラグ接続済。
 - (*4): 接続機器側が支給。
 - (*5): CI-610とCI-620間のケーブル長は50mを越えないこと。
 - (*6): 10mが標準。船管内に布線できる時のみ20mケーブル使用可。
 - (*7): コネクタクランプでアースに落とす。 (*8): ケーブルクランプでアースに落とす。

| | | | |
|----------------|--------------------------|----------------|--|
| 承認 APPROVED | APR. 4. '90 T. NAKAUO | 名称 TITLE | CI-60. 相互結線図 CI-60G INTERCONNECTION DIAGRAM |
| 検図 CHECKED | MAR. 20. '90 M. IKEDA | 製図 DRAWN | MAR. 20. '90 TAKAHASHI |
| | | 図番 DWG. NO. | C7228-C01-K |



| | | | |
|----------------|---------------------------|----------------|--------------------------|
| 承認 APPROVED | AUG. 30. '90 T. AKAJIC | 名称 TITLE | 指示器総合回路図 DISPLAY UNIT |
| 検閲 CHECKED | AUG. 30. '90 M. IKEDA | 機種 MODEL | CI-600 CI-3500 |
| 製図 DRAWN | AUG. 30. '90 TAKAHASHI | 図番 DWG. NO. | C7228-K01-B |



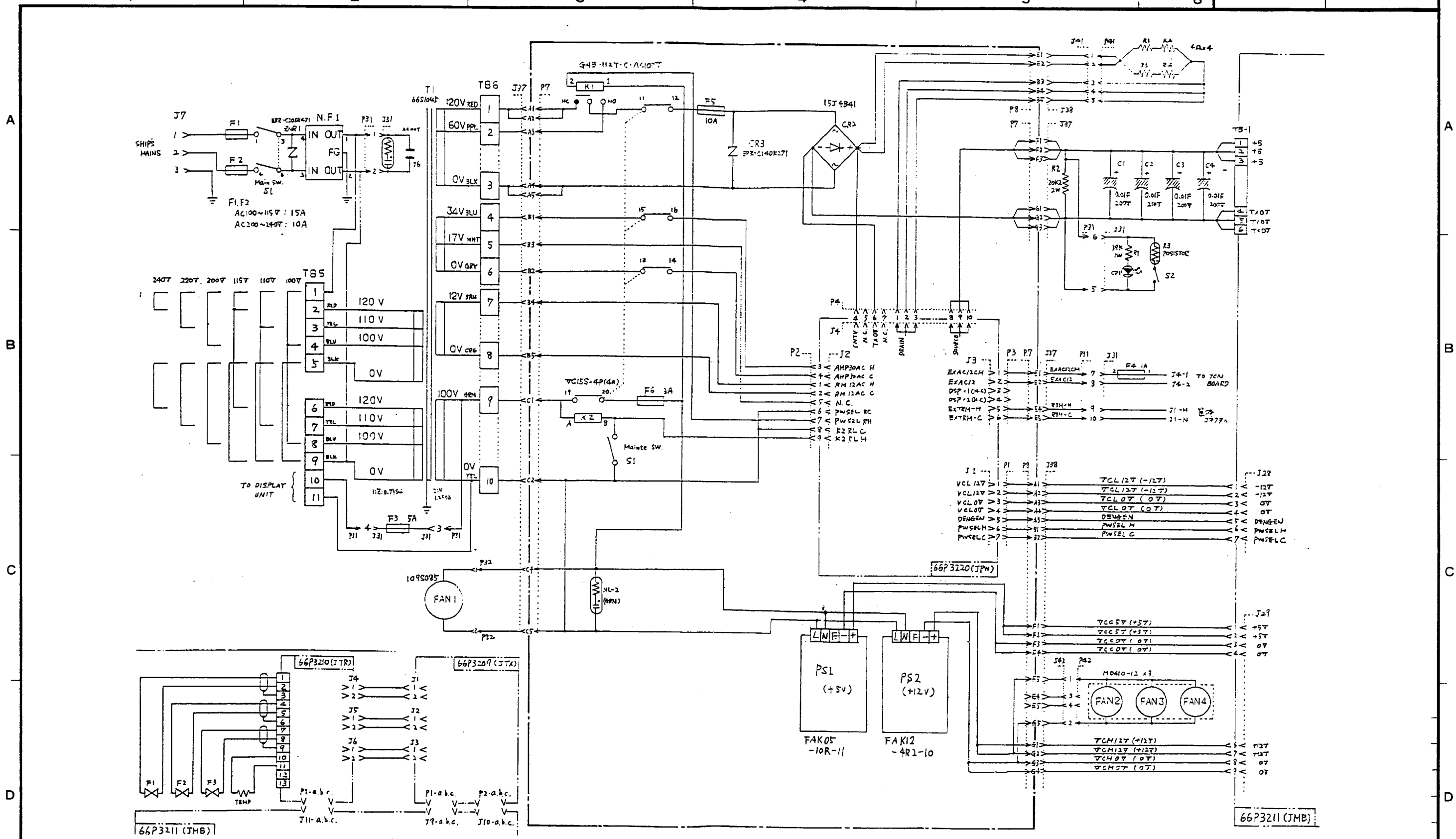
(※印は社外秘回路図
MARK(※): NOT PUBLISHED.

| | | | |
|----------------|---------------------------|----------------|---|
| 承認 APPROVED | AUG. 30 '90 T. JAKALUC | 名称 TITLE | 送受信演算部総合回路図 CI-610 TRANSCIEIVER UNIT |
| 検閲 CHECKED | AUG. 30 '90 M. IKEDA | 製図 DRAWN | CI-610 TRANSCIEIVER UNIT |
| 製図 DRAWN | AUG. 30 '70 TAKAHASHI | 図番 DWG. NO. | C7228-K02-D |

外部機器
EXTERNAL
EQUIPMENTS

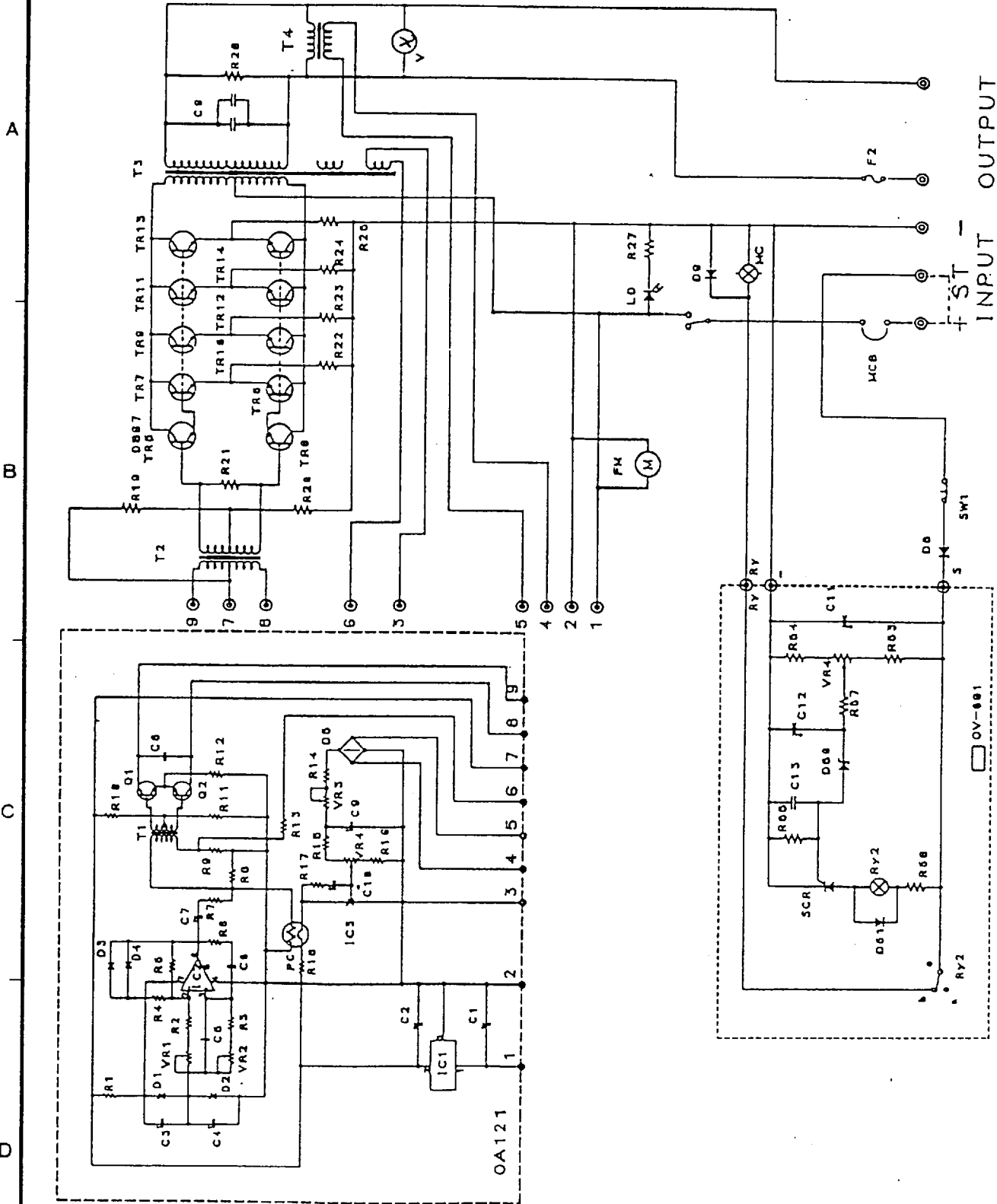
外部
機器へ
通常
使用
しない
AUX.

予備
SPARE
NOT
USED

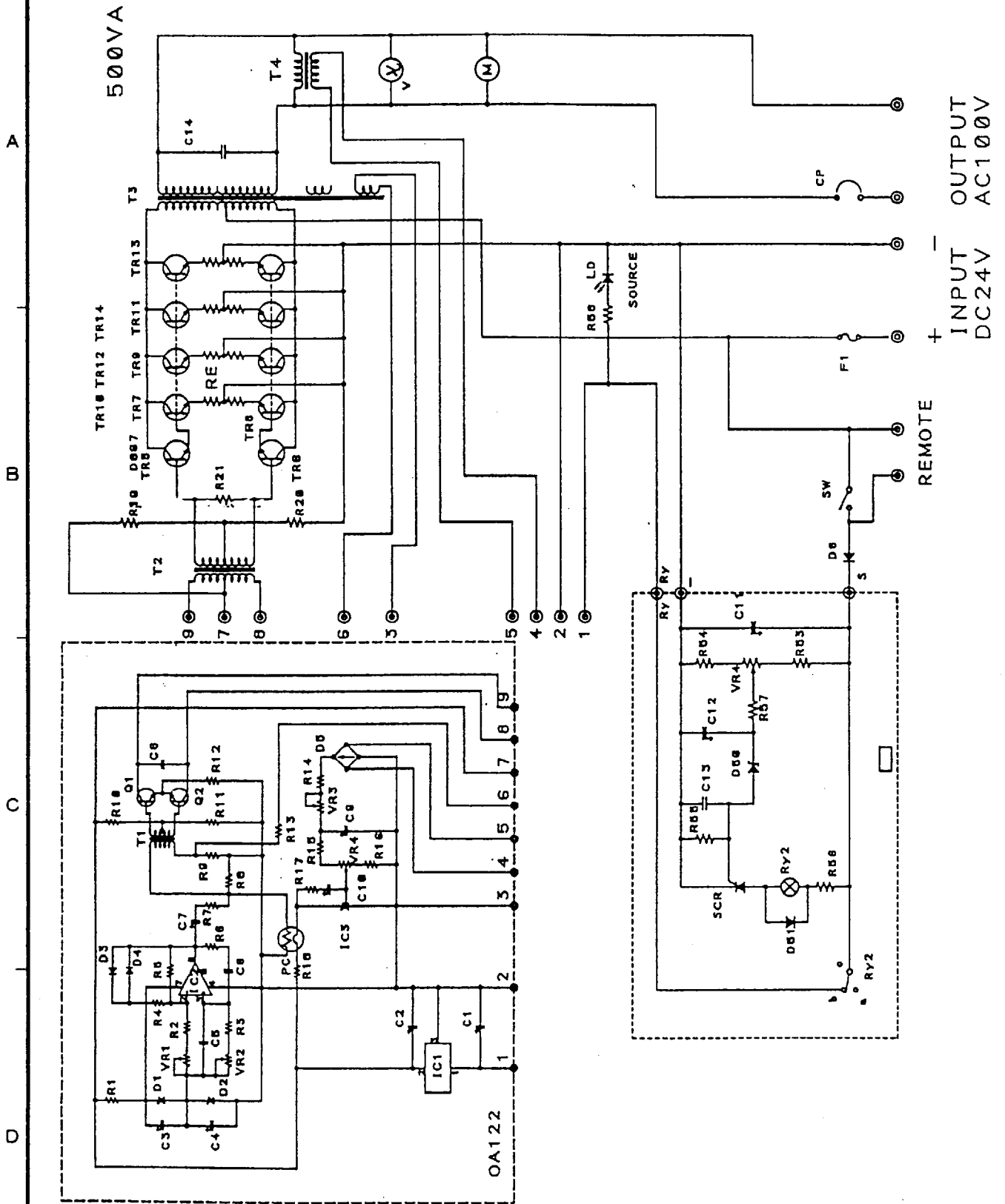


| | | |
|------------------------------------|----------------------------|----------------------------|
| DRAWN Nov. 22 '96 T. JAMASAKI | | TYPE CI-610/CI-3510 |
| CHECKED Nov. 22 '96 TAKA MASHI | CI-35H | 名称 電源ブロック |
| APPROVED Nov. 25 '96 K. OKAMOTO | CI-35 CI-60 | 回路図 |
| SCALE X | MASS — kg | APPLICABLE TO: (MODEL) |
| DWG NO. C7228-K05-D | BLOCK NO. 66-017-2010-3 | NAME POWER SUPPLY BLOCK |
| | | SCHMATIC DIAGRAM |

INPUT DC24V
OUTPUT AC100V



| CI-60 | | 品番 ITEM | 品名 NAME | 材質 MATERIAL | 数量 Q'TY | 図番 DWG.NO. | 摘要 REMARKS |
|----------------|-------------------------|------------|-------------------------------|--|---------------|---------------|---------------|
| 承認 APPROVED | SEP. 7 '90 T. YAKAWO | | 三角法 THIRD ANGLE PROJECTION | 名称 TITLE DC/AC インバータ INVERTER | | | |
| 検図 CHECKED | SEP. 6 '90 M. IICEDA | | R 度 SCALE | TR-2450 | | | |
| 製図 DRAWN | SEP. 5 '90 TAKAHASHI | | 重量 WEIGHT | kg | 図番 DWG.NO. | C7228-K11-A | |



| CI-60/CSH-5 | | 品番 ITEM | 品名 NAME | 材質 MATERIAL | 数量 Q'TY | 図番 DWG.NO. | 摘要 REMARKS |
|----------------|-------------------------|-------------------------------|------------|----------------|------------|-------------------------|---------------|
| 承認 APPROVED | SEP. 7 '90 T. NAKANO | 三角法 THIRD ANGLE PROJECTION | | 名称 TITLE | | DC/AC インバータ INVERTER | |
| 検 CHECKED | Sep. 6 '90 M. IKEDA | 尺 SCALE | / | CSH-5050 | | | |
| 製 DRAWN | Sep. 5 '90 TAKAHASHI | 重 WEIGHT | kg | 図番 DWG.NO. | | C1273-K26-A | |